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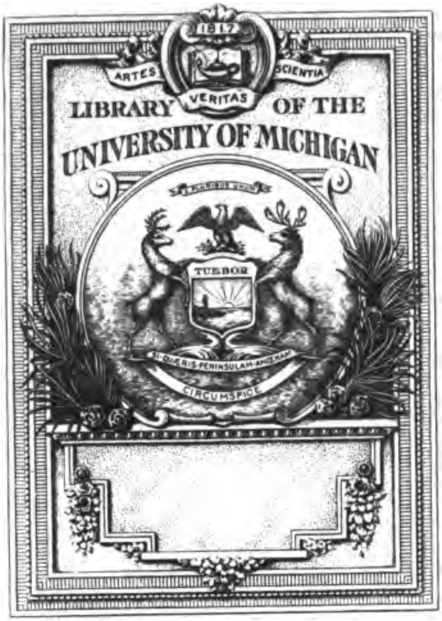
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890 VOL. IV. 1891

THE

OTTAWA NATURALIST.

BEING VOL. VI OF THE

TRANSACTIONS

OF THE

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EDITORIAL.

Being convinced that the publication of the OTTAWA NATURALIST, in monthly parts, is by far the best method of keeping the Club before the public, and also of keeping up the interest of our own members, the editor requested the Council to bring the subject up for discussion at the last annual meeting. It was there referred back to the Council, and at the first meeting of that body it was unanimously decided that for the future our magazine should be issued monthly. It will be observed that an important change has been made in the Council by the addition of three lady-members. It is the earnest desire of the council that the Ottawa Field-Naturalists' Club should be thoroughly successful in every way, and as we have a large number of ladies in the Club, it was considered that by having them represented on the Council, we might frequently get suggestions as to ways in which we could make the excursions or other proceedings of the Club more agreeable to this most important part of our membership. It has always been understood that our Club, while working hard at scientific development, at the same time wishes to be recognized primarily as an institution for teaching, popularising, and making attractive the by-ways of knowledge. The members of the Field-Naturalists' Club are not by any means all scientific; but we are proud to include in our ranks many young students as well as many old children, young in the knowledge of nature—the glorious and enchantingly beautiful world with which a beneficent Creator has surrounded us. The editor again appeals to the members to endeavour to increase the membership. The magazine is now open for the publication of papers on the natural history of any part of Canada, and we are most anxious to obtain members in all parts of the Dominion. The excellent papers now in hand authorize the statement that the magazine will be well worth the subscription even to outside members, who cannot reap the other advantages offered by the Club to its local members. The editor begs to remind the readers of the OTTAWA NATURALIST that although the subscriptions have heretofore been collected at the end of the Club year, they are payable in advance. If members would take this notice as an application and send in their subscriptions, it would save both much trouble and a considerable amount of postage.

J. F.

ANNUAL REPORT OF THE COUNCIL.

To the Members of the Ottawa Field-Naturalists' Club:

Your Council has to report that the club has been carried on during the year now closing with increased interest and gratifying success.

The number of new members elected during the year is 28; the membership now standing at about 230.

There were three general excursions held during the summer: the first was to King's Mountain, Chelsea, by vans; the second was to Montebello by steamboat, and the third to Ox Bow or Big Gully, near Casselman, by rail. A fourth excursion was arranged to Kirk's Ferry, but the weather being unfavourable it was postponed from time to time, and was finally abandoned altogether.

The Saturday afternoon sub-excursions were not so successfully carried on as in former years. In the beginning of the season separate parties were formed in some of the sections, and went in different directions, which interfered considerably with the attendance and also the enthusiasm of the leaders, and the result was that comparatively few sub-excursions took place. It is to be hoped that an effort will be made this spring to establish the interest which previously existed in connection with the sub-excursions, and have them carried on as before.

The winter course of meetings comprised seven soirées and nine afternoon elementary lectures. At the soirées the following papers were read:—Dec. 13th, inaugural address by the president, Dr. R. W. Ells, on the "Geological Progress in Canada." Jan. 10th, "The Mistassini Region," by Mr. A. P. Low; "The Serpentines of Canada," by Mr. N. J. Giroux. Jan. 24th, "Glaciation in America," by Dr. A. C. Lawson. Feb. 7, "Some Geological Facts Observed on a Trip to the Straits of Belleisle," by Dr. Selwyn; "A Bird in the Bush," by Mr. W. A. D. Lees. Feb 21st, "Some Notes on the English Sparrow," by Mr. J. Ballantyne; "The Wolf," by Mr. W. P. Lett. March 7th, "On Some of the Larger Unexplored Portions of Canada," by Dr. G. M. Dawson; "A Naturalist in the Gold Range, B.C," by Mr. J. M. Macoun. March 14th, annual reports of the leaders of the various branches. These soirées took place every alternate Friday evening; the attendance was large and much interest was manifested.

The afternoon lectures were commenced on the 13th of January and continued every Monday afternoon till the 10th of March, as follows: one on geology (volcanoes and their associated phenomena) by Dr. R. W. Ells; one on palæontology by Mr. W. R. Rillings; two on botany, one by Mr. Wm. Scott, and one by Mr. J. M. Macoun; one on zoölogy, by Mr. J. Ballantyne, two on ornithology, by Mr. W. A. D. Lees; one on entomology, by Mr. T. J. MacLaughlin; and one on conchology, by Revd. G. W. Taylor. The attendance at the lectures, especially of ladies, was exceptionally good. The interest in the work of the club by our lady members is becoming more marked every year, and the council desires to express the hope that the suggestions made and favorably discussed at previous meetings, with regard to the election of lady representatives on the council, will be carried into effect at the present meeting.

The treasurer's report will be submitted to you, from which it will be seen that the financial condition of the society still remains satisfactory.

The librarian's report will also be laid before you, enumerating the many valuable additions received during the year; from it you will learn that an effort is being made by that energetic officer to catalogue the publications on hand, and to have some of the more valuable volumes bound.

The proceedings of the club have been published in the OTTAWA NATURALIST during the year, together with accounts of excursions, meetings and all other matters of interest in connection with the work of the year, so that it is considered unnecessary to prolong this report. In conclusion, the council begs again to draw the attention of this meeting to the question of publication and in view of the general expression of regret, among the members, at the change from the monthly to the quarterly plan of publication, would recommend that authority be granted to return to the plan of publishing the NATURALIST monthly.

The editor has expressed his opinion, that with the material now in his hands, there will be no difficulty in keeping up the monthly issue.

All of which is respectfully submitted.

Signed on behalf of the council.

T. J. MACLAUGHLIN, *Secretary.*

TREASURER'S REPORT.

To the Council of the Ottawa Field-Naturalists' Club.

GENTLEMEN,

I have the honour to report that the finances of the club are in a better condition than they have ever previously been, Owing to some unforeseen circumstances, including a short illness on my own part, just before the annual meeting, by which I was prevented from collecting several subscriptions and advertisements which were due the balance shown on the balance sheet, is much smaller that it would otherwise have been. The arrears have again been considerably reduced during the past year, and of those still upaid, nearly all have promised to pay up before the next annual meeting. With the assistance of the Secretary and Librarian, I have been able to keep the expenditure down to the very lowest figure, as will be seen by the balance sheet submitted herewith, which I trust will be found satisfactory.

TREASURER'S BALANCE SHEET, 1889-90.

	RECEIPTS.				EXPENDITURE.		
1889.				1890.			
Mar. 20.	Balance		$30 69	Mar. 18.	The OTTAWA NATURALIST, Vol. III, Nos. 1-4	182.28	
1890.					Postage	6.76	
Mar. 18.	Subscriptions 1889-90	$157.00					$189 04
	Arrears	24.00			Extras. — Flora Ottawaensis	4.75	
			181 00		Extras—Authors'	10.46	
	Advertisements		23 00				15 21
	Authors' extras		12 75		General Printing		3 90
	Transactions sold		11 52		Stationery		2 50
	Excursion receipts		65 85		General Postage		5 22
					Rent of Lecture Room.		12 00
					Binding		8 40
					Excursion Expenses, Conveyances, etc.	47.95	
					Circulars	5.23	
					Postage	4.84	
							58 02
					Balance		30 52
			$324 81				$324 81

JAMES FLETCHER,
Treasurer.

OTTAWA, March 18, 1890.

THE MISTASSINI REGION.

By A. P. Low, *B. App. Sc.*

(Read January 10th, 1890.)

For several years past an exciting controversy has been carried on in the public press as to the size, shape, and position of Lake Mistassini; and a number of writers on the strength of hearsay evidence, aided by brilliant imaginations, have indulged in many extravagant statements in regard to this "Great Inland Sea of the North-East," some affirming that it equalled, if indeed it did not surpass, Lake Superior in size, and that in comparison with it our other inland lakes were mere ponds.

This evening I propose to give a brief statement of the known facts about Mistassini from observations and measurements made by different members of the Geological Survey Staff, and at the same time to outline the route followed, to and from the lake, by the last expedition sent out by the Government.

Before entering upon this, a short historical summary of previous explorations may prove interesting to some present.

Although rumours of a great body of fresh water, larger than any south of the height of land, seem to have reached the French trading in the Saguenay country, soon after Champlain's arrival in Canada, it was not until 1672, that Père Chas. Albanel, a Jesuit missionary, visited the lake. He had been sent overland to Hudson Bay by authority of the French Governor, to visit the posts of the Hudson Bay Co., then but a short time established in the southern part of the bay.

The route followed on this occasion was up the Saguenay to Lake St. John, thence by the Ashouapmouchouan River to its head, across the height of land, and through lakes Chibougamoo and Obatagoman, large bodies of water feeding the Notaway River, which flows into James Bay. From here by short portages into Lake Wawaniche, and so into the S.W. Bay of Mistassini.

Père Albanel, from his account recorded in the "Relations des Jesuites," appears to have passed up this bay to the end of the point separating it from the S.W. Bay, and from there crossed the mouth of the latter, and proceeded along the west shore to the outlet of the Rupert River, down which he voyaged to the James Bay.

The following is a translation of the account given by Père Albanel in the "Relations of the Jesuits":—

"June 18. We entered Great Lake Mistassini, which is so large that it takes twenty days of fine weather to make the tour. This lake takes its name from the rocks of prodigious size with which it is filled. It has a number of very beautiful islands, ducks and fish of all kinds, moose, bears, cariboo, porcupine and beavers are here found in great abundance. We had already made six leagues to the traversé of the islands which cut the lake in two, when I perceived something like an eminence of land at such a distance that the eye could just reach it. I demanded of our people if it were near the point where we must go. 'Keep quiet,' said our guide, 'and do not look there, if you do not wish to perish.' The Indians of these parts believe that whoever wishes to cross the lake must carefully guard from looking at the route, especially at the place to which they must cross, a single glance, they say, will cause the rising of the waters and great tempests, which will surely upset them."

This is the whole of the description given by Père Albanel in connection with Lake Mistassini, but he must have made a rough map of the route followed, as we find on a map of Canada compiled by Père Laure in 1720, a plan of Mistassini with the route followed by Albanel on it. The statement that it took twenty days of fine weather to make the circuit of the lake, has formed the base on which all the extravagant estimates of the size of the lake have been built.

The arguments used being in about this style: If it takes twenty days to go round the lake, ten days would be required to go from end to end, and as an Indian can paddle from three to four miles per hour, and the paddling time of a summer's day would average from twelve to fifteen hours, therefore the lake must be from three hundred and sixty to six hundred miles long.

Unfortunately, like other estimates based on what might or could be, this falls to the ground, because the Indian, although he *can* paddle from three to four miles an hour, finds it too hard work when he is in no particular hurry, and also, that, although he may travel from twelve to fifteen hours per day, he does not. From experience of Indian travel, I find that he loses considerable time taking down, and putting up his bark house morning and evening, and, while travelling, stops to look at every bird or animal that may come within range of his far-seeing eye; and not only this, but he stops at about every point which may happen to jut out in his way, where, it the kettle is not boiled, at least a slight lunch is made off a smoked fish or some similar luxury, and everybody gets out of the canoe, except the old squaw in the stern, who remains guard over the canoe and provisions, and keeps the accompanying dogs from a too free use of the latter.

To sum up, an Indian on his annual summer excursion, such as a trip around Mistassini would be, does not average more than ten miles a day, so that the estimate given by Père Albanel proves correct when taken in the proper way.

The French botanist, Michaux, visited the lake in 1792. He followed the route taken by Albanel, and quotes him in his description. Michaux found several new species of plants along the route, one of which he named after the lake, *Primula Mistassinica.*

In 1820, Mr. Jas. Clouston made an exploration of the country east of James Bay for the Hudson Bay Company. On his map, the south end of the lake, below the Rupert River, is well laid down; but he does not appear to have gone round the north end.

For nearly one hundred years the Hudson Bay Company have had a trading post on the lake, and early in the present century their great rival, the North-West Company, had a similar establishment at the south-west end.

In 1870, Mr. James Richardson was sent by the Geological Survey to explore the country north from Lake St. John to Mistassini. He visited the southern bay, and reached the Hudson Bay Post, but was obliged to return from there on account of his provisions running short.

The year following, Mr. Walter MacOuatt was sent to continue the work, and made a survey of the two southern bays and the west shore to beyond the outlet of the Rupert River, when he was obliged to stop for the same reason as Mr. Richardson.

In 1882, some members of the Quebec Geographical Society having read Père Albanel's account of the lake, which, added to the extravagant stories of Indian and half-breed hunters about Lake St. John, convinced them that they had a perfect inland sea, and the Government was petitioned to finish the surveys previously begun. Their request being granted, the party to which I was attached was sent out in 1884, with Mr. John Bignell in charge.

Mr. Bignell was recalled in the spring of 1885. On his return to Quebec, many startling statements as to the great extent and immense size of the lake appeared in the press of that city and were copied by the newspapers all over the land. On my return, in the fall of 1885, I reported on the measured size of the lake, but, as it fell far short of the previous stories, and as the press of Quebec continued to support Mr. Bignell's statement—based on Indian exaggerations,—the general public were in a state of uncertainty which to believe. During the past summer, however, Prof. Louden and Mr. MacDonald, of Toronto, resolved to make a trip to the lake to solve the problem. A full account of their trip was published in the newspapers, which, I am happy to say, corroborated my report; and thus the matter is settled.

The great area of country stretching from the Gulf of St. Lawrence north-westward to Hudson Bay forms a low-lying plateau of Archean rocks. The height of this plateau averages about 1,500 ft. above sea level, rising slowly from about 1,000 ft. near the edge to about 2,000 ft. in the interior. The surface of this plateau is by no means flat, being covered with low rounded hills, which are roughly arranged in a series of ridges more or less parallel to themselves and the general strike of the rocks. These hills are the stubs of extensive and elevated mountain chains which, from exposure to subaëreal denudation for countless ages, and from having been subjected to the glacial action of later geological times, have been ground down to their present unimposing state. In the interior the difference of level between these ridges and the valleys separating them is small, the hills seldom rising 100 ft. above the general level. As the coast is approached the difference is more marked, the long action of ancient rivers having deeply cut out the principal valleys below the surrounding country, thus causing a more marked contrast in level and at the same time much finer scenery.

Near the height of land, the valleys between the low hill ridges are often quite wide, and are everywhere covered by innumerable lakes, many of which are of great area, but more often of small size.

These lakes are always connected by small streams, with rapids or falls between them. The streams flowing from these different lake chains join to form the many large rivers which flow out of this area. Along the lower courses of these large rivers, lakes are not common, the greater volume of water having cut through and removed the boulder drift and solid rock barriers, which cause many of the lakes in the interior. From this description it will be seen that our northern country is everywhere covered with a net work of waterways, navigable without much difficulty in any direction with light canoes capable of being transported across the intervening portages.

It was by one of these waterways, the Bersimis river route, that we reached Mistassini.

This river empties into the Gulf of St. Lawrence some 160 miles below Quebec. At the mouth is situated a large village of Montagnais Indians. These Indians are under the care of Roman Catholic missionaries, and are well advanced in civilization, many of them owning log houses and resorting to the woods only in the fall, where they hunt furs all winter, returning to the village in the spring, and there remain mostly in an idle state during the summer, living on the proceeds of their winter's hunt.

The journey was undertaken in small bark canoes, two men paddling each. The first 45 miles was a monotonous paddle along shore against a strong even current; between high vertical clay and sand banks, in a river valley from ½ to 1 mile wide, with walls of gneiss rising from 300 to 600 ft. above the river. The hills and river bottom are covered with a dense forest, the trees being white and black spruce, tamarac, balsam fir, balsam and aspen poplar, white and yellow birch. There is no pine. These trees afford logs 24 inches in diameter at the butt, and are cut into deals by a steam mill at the river mouth.

At the end of this stretch, which took three days to paddle, the first of a long series of portages was reached. The first portage passes a double fall of 100 ft., with a large whirlpool between, on the edges of which thousands of logs are piled up. Above this the river for 30 miles is a succession of falls with sluggish water between.

These portages culminate in one 10 miles long, the first 4 miles being up a mountain 1,000 ft. high, and unavoidable, as the river in this distance breaks through a high range of hills, and falls 500 ft. through a deep canyon with perpendicular walls.

In 1870 a great fire passed through this country, destroying hundreds of thousands of square miles of valuable timber, the area burnt reaching from the St. Maurice river on the west to beyond the Bersimis on the east, and from Lake St. John to the Height of Land. This vast region has a very desolate appearance, the blackened tree trunks standing or partly fallen on barren sandy soil or bare rocky hills, which have been whitened by the kaolinising action of the fire on their felspathic ingredients; a second growth, of small spruce and banksian pine is beginning to replace the old forests, and a profusion of blueberries grow everywhere, the only and great consolation for the desolate scenery. When the river was again reached, but one portage was encountered to Lake Pipmaukin, 40 miles distant.

Here our meagre diet of pork and flour was augmented by a supply of fish, large pike being taken on the troll below, while above the portage quantities of fine brook trout, averaging 3 lbs in weight, rose readily to the fly. These fish had apparently come out of the lake to deposit their spawn on the shallow gravel bars, in the swift running water of the river.

The date was the last week in August, and as I have since remarked these fish on the spawning grounds everywhere about this time, I think it would be well to have the present close season advanced a month, as now, the fish are taken upon the spawning beds with great ease in the open season.

Lake Pipmaukin is full of deep bays, and has an area of over 1,000 square miles. We were delayed here until Sept. 19th, partly owing to equinoctial gales which prevented us from crossing the lake in our small canoes. During the month of September the temperature fell every night to near or below freezing point, and sheet iron stoves were put up in the tents, which greatly added to our comfort.

From Lake Pipmaukin a portage route was followed up a small river emptying into the lake, and then through a number of small lakes westward into the Manouan River, a branch of the Peribonka, which flows into Lake St. John. This river was ascended to a large lake of the same name at its head. But few pleasant days had been experienced since leaving Lake Pipmaukin, and here on Oct. 5th we had our first snowstorm about 5 inches falling, part of which never left the ground. From here the men were sent by a similar portage route to the Peribonka River with half loads, as the small streams would not permit full loads being carried. On their return, fearing to be frozen up before ascending the Peribonka, it was resolved to push on as far as possible before the ice rendered canoe travel impossible, so the Peribonka was reached and ascended, a distance of 30 miles to a small western branch on the route to Mistassini. This branch was followed six miles to a small lake, which was found to be frozen over, and so our canoe voyage ended Oct. 23rd. No one was sorry, for the travelling, owing to the cold stormy weather, was extremely disagreeable; the paddles were often caked with ice, and only by vigorous paddling could a moderate warmth be kept in the body, while the feet were always cold, and several times we were obliged to stop during the day and build fires to restore the circulation in our benumbed hands and feet.

From Oct. 23 to Nov. 29th we remained at this small lake, the men being engaged making snowshoes and long narrow toboggans, on which our provisions and outfit were now to be transported. Here traps were set and hunting indulged in. The traps caught a couple of otters, some mink, and a few martens. Good sport was had shooting muskrats on the ice before the lake froze solid, and a stew of these animals proved very acceptable after our long diet of salt pork. Before winter set in little game had been seen, a few spruce partridges, sheldrakes, fish eating ducks, whistlers and sea gulls only being shot, but everything in the shape of fresh meat went into the pot and was eaten with relish. On Oct. 25th the first ptarmigan were seen, and from that time continued to be killed in moderate numbers.

These birds in the winter pass southward from their breeding grounds in the barren lands some distance north of Mistassini, and feed on the buds of willows growing in the marshes and around the lakes.

During seasons when the snow is deep and their food supply consequently scarce, they proceed as far south as Lake St. John, and have even been killed immediately north of Quebec.

On Nov. 27th we commenced our winter's journey to Lake Mistassini, and as each day's journey was the same, a description of one will do for all. Breakfast was taken in the tents at daylight, and then everything packed up and laid outside; the stoves were taken down and a fire lighted, at which the frozen bottoms of the tents were melted in order to fold them; these were laid on the sleighs, the baggage and provisions laid on, wrapped in the tents or coverings, and securely lashed with long lines; at this work considerable time was lost, so that the line of march was seldom taken up before 8.30 a.m. The guide, with a light load on his sleigh, led the way and broke the path, the rest following in Indian file, each dragging a load of 200 lbs. weight. Thus the party journeyed on through the desolate country over low rounded hills and across long narrow lakes lying north and south. As the height of land was approached, the timber was found to consist almost wholly of black spruce and tamarac of small size, which scantily covered the rocky hills and swampy lake borders. At noon a stop was made near a lake or small stream, and dinner prepared at a fire built on the snow, after which the march was continued until about 4 p.m., when we pitched our tents for the night.

A place being selected for the tents, the snow was evenly packed down by tramping on it with snowshoes, then the tent and stove set up, a good supply of brush laid on the bottom, and covered with waterproof sheet and blankets, a fire lighted, and soon the tent was perfectly warm and comfortable, even with the thermometer outside 40° below zero.

The men were employed until dark cutting the night's supply of fire-wood, after which supper was eaten, a pipe smoked, and then all turned into the blankets.

The weather during December alternated between extremely cold and clear, and wild stormy days; on the stormy days the camp was not changed and the men employed the time in hunting beavers in the small lakes about. When signs were discovered, the whole party proceeded to the spot; the ice was cut round the margin of the pond and stakes placed across the outlet and inlets to prevent the escape of the beavers, any holes in the bank similarly stopped; attention was then turned to the house, a trough was first cut in the ice around it, when the outlets were found, a small stick was hung in front ot each, and a man put on guard. The rest then broke into the house with axes and ice chisels and so routed out the inhabitants, when one started out he disturbed the stick and the man on watch plunged his arm into the water and in an instant had it on the ice where it was immediately dispatched with a club. If luck was good, two or three beavers would reward a day's work of this kind, but several times blanks were drawn.

In this manner the journey was continued and the height of land reached December 9th.

Here an escarpment running N. E. and S. W. was descended 300ft. to a comparatively level country stretching away to the northward. Just beyond the height of land is a large lake called Temiscamie; this was crossed and the river flowing out followed 16 miles, when a portage of 2 miles was crossed into the head of Lake Mistassinis or Little Mistassini.

This lake lies parallel to the big lake on its East side, and its level is some 40 or 50ft. above the latter. On its east shore, perpendicular cliffs of limestone rise in places 50 or 60ft. above the water; this limestone is of a greyish blue colour and is often quite cherty, a similar rock is seen on the shores of the larger lake, both in fact resting in great basins scooped out of these rocks, which seem to be an outlier of Cambrian rock, similar to those of the east coast of Hudson Bay, which here rest in an old depression in the Archean.

Little Mistassini was followed to its southern end, where a portage of six miles was made to the great lake and its shore followed some 35 miles to the Hudson Bay Post which was reached December 23rd. The last ten days journey was very hard as provisions ran out, first the pork and then the flour, and starvation was kept off partly by a generous contribution of fish from an indian encampment which we happened upon near the end of Mistassinis and by a small supply of provisions from the post, also by finding on lines set through the ice a few large turbots (*Lota maculosa*) called Maria by the Hudson Bay people and common to all the great lakes of the north. The post was reached in a blizzard, from the effects of which everybody suffered for several days, black patches of skin showing where the frost had done its work.

On Christmas day we dined at the Hudson Bay Post and were regaled on roast beaver and lynx, the former has the flavor of strong mutton while the latter closely resembles young pig, the flesh being white and delicate. These were followed by a real plum pudding. The ordinary fare at the post consisted of salt fish and watery potatoes, three times a day, relieved with an occasional meal of partridges or rabbits, and with fresh fish once a week.

January was spent around the post, considerable cold weather being experienced, the mean temperature from 3 daily readings with max. and min. was 18.5° below zero, the highest being 16° above and lowest being 56° below zero, which point was reached twice during the month.

On February 2nd, I left with two men for Lake St. John, the men drawing our small outfit and provisions of flour, lard, and tea on their toboggans. The first night out we slept in the teepee of an indian who was to guide us over the height of land. This is made of a number of poles meeting in the centre and covered with birch bark ; it has a large opening at the top, for the escape of the smoke from the fire built on a few stones in the centre of the floor. The bottom and sides are lined with green boughs. It is a most uncomfortable dwelling, as the smoke which fills the upper part, renders standing up or even sitting upright impossible, when lying down the feet are roasted by the fire while the head and shoulders are freezing from the cold draughts which penetrate through the cracks and openings in the birch bark covering.

On the trip to Lake St. John the journey was very similar to that already described ; we passed from the southern end of the lake immediately over the height of land and then followed the Chef river of the Ashouapmouchouan and thus reached our destination.

Being unable, on account of heavy falls of snow, to drag our tent and stove, they were abandoned and we were obliged to sleep during the greater part of the trip in barricades. These are made by digging a hole in the snow 12ft. long by 6ft. wide down to the ground and lining one end with boughs with a fire in the other end. No great discomforture was experienced in this mode of sleeping, as we crawled into our blanket bag, made of woven strips of rabbit skin ; this, although the finger can easily be pushed through it anywhere, is a remarkable non-conductor of heat, and thus retained all the body heat even with the thermometer far below zero.

The return journey from Lake St. John to Mistassini was commenced April 9th. Mr. J. M. Macoun and 6 men accompanied me. As the season was now getting late, the toboggans used in the winter were exchanged for low sleds shod with mill saws, the teeth of which were removed. This change was made on account of the soft snows in the spring sticking to the wooden bottoms of the toboggans and rendering them exceedingly heavy to draw; the higher sleigh also protecting the goods on them from the water lying upon the ice of the rivers and lakes.

The route followed by the party this time, was up the Ashouapmouchouan river to its head on the height of land, 50 miles westward of Mistassini, thence over the ice of three large lakes, Obatagoman, Chibougamou and Wahwaniche into the southern part of Mistassini.

The travelling at this time of the year was simply delightful. A start was made at break of day, breakfast being over and everything packed in readiness before that time. The cold during the night freezing the snow, melted by the sun's rays on the previous day, formed a hard crust everywhere, over which we travelled without snowshoes until dinner time between 8 and 9 o'clock. After this the sun softened the crust and snowshoes were worn, the walking becoming heavier and heavier until about 12 o'clock when the crust was wholly melted and all travelling impossible. Then camp was made and supper eaten, after which everybody went to bed to rise between 1 and 2 a.m. In this way the Hudson Bay post was reached April 29th. The only adventure was an involuntary three days' fast, owing to a period of soft weather setting in before reaching the post, rendering travel impossible and causing our estimated quantity of provisions to fall short by that amount. At this time four of the men walked sixty miles in forty hours without a bite to eat, which shows the endurance of these indian and half-breed hunters.

From April 29th to May 28th, a period of enforced inaction occurred owing to the breaking up of winter.

On May 24th the thermometer registered 80° in the shade, the highest temperature recorded during the summer, and we experienced the novel sensation of floating about on ice floes in the morning, bathing in open water at noon, and sweltering in the shade in the afternoon, attended by swarms of hardy and energetic mosquitoes.

It was surprising to note the rapidity with which the ice disappeared from the S.E. Bay. On the morning of the 24th it was firm enough to support a man with a sleigh-load of provisions, by noon only loose pieces were to be seen floating about, while in the evening every sign of ice had disappeared. This rapid melting of the ice is probably caused by a general rise of temperature of the water of the lake from the number of small streams flowing in, until a point is reached sufficiently above freezing to allow an expenditure of heat sufficient to melt the ice in all parts simultaneously, which has been previously rotted and honeycombed by the sun's rays.

The ice in the main body of the lake, owing to its greater volume of water, did not break up for a week later. From May 28th until June 27th our men were away for provisions stored during the winter at Lake Ashoupmouchouan. During their absence Mr. Macoun and I were employed with latitude observations, attending to weather readings, noting the arrivals of the birds, and collecting and noting the growth and development of the various plants, besides this we also made and planted a small garden, putting in the seed brought in for experiment. The following birds were noted throughout the winter about Mistassini: The chikadee, winter wren, pine grosbeak, white winged crossbill, common red-poll, snow bunting, black snow-bird, whiskey jack or Canadian jay, downy woodpecker, day owl, spruce partridge, partridge, and willow ptarmigan. On May 2nd a flock of Canadian geese passed north. On the third a number of golden-eyed ducks alighted in the open water of the narrows. A single pair of the greater yellow legs was seen, and a robin was heard on the 7th.

Then came quite a rush during the next 10 days.

On the 10th a white bellied swallow, the 11th ruby crowned kinglet, sheldrake and ring-billed gull; on the 14th the cow-bird, rusty grackle, belted kingfisher and loon; on the 15th the sea coot, and tree sparrow; on the 20th, the water-thrush, Swain's sparrow, white-throated sparrow and dusky duck,. Then before June 1st hermit thrush, yellow bird, magnolia warbler, black-capped yellow warbler, song sparrow, raven, night hawk, ring-necked plover, surf duck, sheldrake, Forster's tern and the black throated diver.

While the following arrived between that date and June 15, Tennessee warbler, black poll warbler, yellow bellied flycatcher, golden-winged woodpecker and fish hawk. The cedar bird and night heron being noted later on in the season.

It was not until May 24th that a flower was found in bloom, when a few blossoms of *Epigæa repens* were discovered; but a week later the whole of the woods about were carpeted with this lovely bloom.

During the first week in June the only herbaceous plants in flower were sweet colt's-foot (*Nardosmia palmata*), the strawberry, the white violet and the beautiful little *Primula Mistassinica*. In damp or wet grounds, however, leather leaf, sweet gale, the green alder, red and fetid currants, and the laurel (*Kalmia glauca*) were in great abundance.

During June about 100 species of flowering plants were noted, but with the exception of *Calypso borealis*, which is quite common about the lake, none were of particular interest or rarity.

Shortly after the breaking up of the ice in the lakes, the Indians belonging to the post arrived with their families, bringing in the furs collected during the winter. Mr. Millar and his assistants were kept busy gathering these and crediting the value of them against the accounts of the owners. The fur trade is run altogether on the credit system. The Indian receiving debt in the fall in the shape of shot, powder, tea, flour, sugar and clothing, the amount being regulated by the amount of fur brought in the previous year, and the prospects of a successful hunt during the coming season. No cash is known, and trade is carried on by a system of barter, the standard being a "mid beaver skin," by which is meant the skin of an average sized beaver. From this as a basis the values of other skins are determined; for example, a large beaver is worth 1½, a small ½, a marten 2 a mink 1, an otter 3 to 4, a bear 4 to 8, a silver fox 9 to 15, and so on. The values of the articles of trade are regulated in a similar manner. One beaver will purchase any of the following:—6 lbs. flour, 2 lbs. sugar, 1 lb. tobacco, 1½ lbs. tea, 2 lbs. pork, 1 lb. gunpowder, 2 lbs. shot, 1 cotton handkerchief and other things in proportion. Now, as the average debt allowed each hunter is little over one hundred beavers, one can see that after purchasing the necessaries for the ensuing year but little remains for luxuries in the shape of red handkerchiefs, etc.

On the arrival of a new lot of Indians the women already at the post went to the water's edge to greet the new comers, which they did by embracing and kissing, and then indulging in a good cry all round; their emotions being thus appeased they soon became merry and talkative. Twenty-six families belong to this post, about 150 persons in all. They speak a dialect of the Algonquin or Cree language, being a tribe of that great family which inhabits the country from the Rocky Mountains to the Atlantic. As a rule they are not of great stature, though some of the men are fine stalwart fellows, six feet tall.

Form long contact with the Hudson Bay Co. and missionaries they are all pretty well civllized, everybody being able to read and write in a kind of syllabic shorthand, invented to fit the language by the English missionaries to the west. An Indian's writing materials consist of a piece of birch bark and a burnt stick, while a forked stick placed in a prominent position on a portage or at the forks of a river serves as a post-office.

They are all perfectly honest, and would not touch provisions left in the woods even to save themselves from starvation.

Although all are nominally Christians, they still cling to many of their old beliefs and superstitions; anyone who claims to be a conjuror or medicine man is held in great respect and dread by the rest of the community. The conjurors claim to be able to commune in spirit with other conjurors, and also by the aid of spirits to foretell the future, and learn what is happening at the moment to persons at a distance. By the aid of charms and spells they are believed to bring sickness, and even death to anyone who may offend them. They also pretend that the spirits would supply them in times of hardship and famine with deer's meat, fish, and a little flour, but no tobacco or whiskey.

Allegorical animals are dreaded and propitiated by these indians, the greatest among these is the big muskrat who travels under the snow, there is also a big beaver, and a big dog, who does not walk on the ground but upon the trees. In Mistassini is a large trout, so long that he cannot turn round, who causes all the storms on that lake by moving its tail. They have also enormous giants living in the solid rock. They also believe that certain of the animals understand their language, especially the bear who is a close relation of theirs, and an indian never shoots one without first offering an apology for the act. Great respect is paid to to the bones and flesh of the bear and beaver, their skulls are always scraped clean, and set up on poles facing the sun.

Cannibalism is abhorred; the belief being that anyone indulging in human food immediately becomes crazy and is forced to wander about in a starving state until death affords relief; on suspicion of such an act the suspected party is killed. Maniacs are tied to stakes and allowed to starve to death; this is a cruel practice but is thought necessary for the safety of the community at large, as no proper restraint can be put upon such dangerous persons.

All the able-bodied men are employed during the summer in transporting the furs down the Rupert river to Hudson Bay, and in bringing in the stock of provisions and goods for the next season's trade. Six large canoes, each manned by six men are required to bring in the outfit, and every capable male is required for this work, only the very young and old remaining behind.

On the arrival of our men with the provisions, we left the post June 30th, with a large and small canoe, having secured the services of two old indians who were too feeble to undertake the voyage to the coast with the brigade. Passing up the S. E. bay we soon reached the big narrows and continued up the lake through a string of large islands in its centre, until we reached a point opposite the outlet of the Rupert river, when we crossed to the W. shore taking one sounding of 374 ft. Owing to the large stone employed in this operation and a threatening thunderstorm, we were unfortunately unable to take more. Passing the Rupert, the work of survey was taken up at the place where Mr. MacOuatt finished, and from there carried completely round the north end and down the east side to the big narrows, where connection was again made with MacOuatt's work, thus completing the work commenced by Messrs. Richardson and MacOuatt.

From the results of this work, it is found that Lake Mistassini is a loug and narrow body of water, stretching from north-east to south-west, with a perceptible curve between the ends, the concavity of the curve being towards the south-east. It lies between N. Lat. 50° and 50° 24′, W. Long. 72° 45′ to 74° 20′, or 300 miles directly north of Lachute. The length, in a straight line between the extremities of the north-east and south-west bays, is nearly one hundred miles, the average breadth of the main body being about twelve miles. At either end of the lake, a long point stretches out, dividing the ends into two deep bays. Between the points, and seemingly a continuation of them is a long chain of rocky islands, which, by overlapping each other, almost divide the lake into two parts, so that a view of the opposite side is rarely obtained in going around the shore. A slight decrease in the present level of the lake would result in the production of two separate lakes, as the water between the islands is quite shallow, and forms a contrast in this respect, with the great depth between the islands and shore on either side. Here the lake is very deep, the isolated sounding, made in crossing, having given 374 feet, at a point which, I was informed, was not the deepest part of the lake.

The bay at the south-east end of the lake is called Abatagush. This bay, sixteen miles from its mouth, is again divided by a long point into two other bays. About four miles from the end of this point, and on it, the Hudson Bay post is situated.

The eastern part, called Cabistachgan Bay, runs slightly east of south, in an irregular course, for about twelve miles, the Little Perch River coming in at its head. The western part is much larger and more irregular. It stretches south for sixteen miles, a small river from Lake Wakiniche falling into it at that distance. A side branch of the bay runs to the westward for upwards of ten miles. The general width of Abatagush Bay is one and one-half miles. The south-west, or Poonichaun Bay, for a distance of twenty miles from its entrance, has an average breadth of about five miles. Its shores are broken by smaller bays, and its surface is covered with islands, varying from six miles long by one and one-half wide, to mere boulders. After the first twenty miles, the bay narrows to an average breadth of less than one-half mile, and continues in a south-westerly course for a long distance, as the end was not reached after ascending it fourteen miles. The

Indians say that a large river empties into the lake at the head of this bay. The north-east and north-west bays are not so deep as the southern ones; the distance from the end of the point to the mouth of the Papasqutsatee River, a large stream coming in at the head of the north-west bay, being fifteen miles, with an average breadth of rather more than four miles. From the mouth of the Toquaoeo River, which enters the north-east bay at its head, to the end of the point, the distance is nineteen miles, the average breadth being under four miles. By this river a canoe route goes to a Hudson Bay post, called Nitchicoon, situated on a branch of the East Main River, to the north-east. This stream falls rapidly during the dry season, being an exception to the other rivers running into the lake, which, taking their rise in large lakes, are not generally affected by local rainfall.

Besides those above referred to, the large river flowing out of Lake Temiscamie, and passing through Lake Mistassini, enters the lake on the east side about twenty miles from the head of the north-east bay. Almost directly opposite this river, on the west side, a smaller stream, called the Wabassinon River, enters.

The shore of the lake is indented by a number of smaller bays, and many islands also occur along its margin. The shores are mostly rocky, with no marshes or beach, a fact accounting for the absence of any great uumber of wading birds or graminaceous ducks. The western bank rises from thirty to sixty feet above the surface of the water, and is in many places perpendicular. The eastern bank is not so elevated, and rises more gradually.

To the south of Mistassini, and running north of east, is a ridge of hills forming an escarpment about 300 feet high, and constituting the Height of Land between the waters flowing to the St. Lawrence and those draining to Hudson Bay, and the present division lines between the Province of Quebec and the North-east Territory. To the north is another range, passing within ten miles of the lake and trending away to the westward. The highest of these hills does not rise more than 500 feet above the level of the lake.

The country in the vicinity of the lake is generally slightly rolling, with rounded hills, rising from thirty to sixty feet above the water, and interspersed with numerous small lakes and marshes.

On the main body of the lake, and to the northward, the summer season is shorter and colder than in the vicinity of the post. During the month of July, the low lands bordering the lake were frozen solid within one foot of the surface, in all places where the trees were at all dense. This marked difference is undoubtedly due to the proximity to such a large body of cold water, which lowers the general temperature of the air during the warmer portions of the year. The soil overlying the Laurentian gneisses and schists is light and sandy, only a thin layer generally resting on these rocks.

At the Hudson Bay post, the most favorable point on the lake for agriculture, a poor crop of potatoes is raised yearly. They are small, as the tops are always frozen before reaching maturity. In the spring, as soon as the frost was out of the ground, I sowed garden peas, beans, corn, and turnips. On August 20th the peas were beginning to fill the pods, the beans were in flower, and the corn only eighteen inches above the ground; the turnips also were growing nicely. I believe that barley has been sown here, but would not ripen.

Covering the higher ground, at the southern end, white spruce, poplar, balsam-fir and white birch trees were found, some of which had a diameter of eighteen inches, three feet from the ground. The swamps are covered with a thick growth of small-sized black spruce and tamarac, and the small areas of burned land are generally clad with a second-growth of banksian pine.

Having no pork, our men from lake St. John refused to remain longer, so Mr. Macoun and I were again alone at the post awaiting the arrival of the brigade from the coast, having engaged a passage down the Rupert river in the canoe returning there.

After the arrival of the canoes, we left on Aug. 22nd, and travelling from daylight to dark in a large canoe with ten paddles, we reached Rupert House September 3rd. From that place we crossed the south end of James Bay to Moose Factory, and then went up the Moose River to the C. P. Ry. at the Height of Land, where we left the canoes after an interior water journey of over 1000 miles.

habit and appearance. They are either low, much branched and spreading over the ground or erect and simple. The leaves vary from short, and obtuse, to 4 inches in length, with a tapering point as in the var. *hirsuticaulis.* The size of the flowers and the degree of pubescence vary no less than the leaves.

With regard to these closely allied forms of this genus it is imperative that they should be grown from the seed under the same conditions and several specimens studied in a living state.

1044. A. JUNCEUS, Ait.

A. æstivus, Ait.

Peat bogs, in shade. July—2. (B) A slender species with long narrow leaves. Flowers white tinged with pink, and few in number. Our earliest Aster.

1049. A. PUNICEUS, L. (Tall Michaelmas Daisy.)

Low ground. July—3. (B) A tall handsome species with hairy red stems, auricled clasping leaves and bluish-lilac flowers.

—————— var. LAEVICAULIS, Gray.
var. *firmus,* T. & G. Macoun's Cat. p 226.
var. *vimineus,* Gray.

Much scarcer than the type, with paler flowers and almost glabrous stems.

2170. A. VIMINEUS, Lam.

A. vimineus, Lam. var. *foliolosus,* Gray. of Macoun's Cat. p. 545.

In damp soil along the Nation River at Casselman. (Prof. Macoun) Aug—3. A tall species akin to, but distinct from *A. paniculatus,* with long narrow leaves and whitish flowers.

Prof. Macoun tells me that his Casselman specimens recorded above belong to the species and not to the variety *foliolosus.*

1050. A. NOVÆ-ANGLIÆ, L. (Purple Michaelmas Daisy.)

Rocky banks. Aug—2.

Found only at Casselman so far, in this locality. (Miss Nellie Macoun). Easily recognized by its bright purple flowers and viscid glandular pubescence.

1061. A. ACUMINATUS, Mx. (Pale Aster.)

Sandy and rocky woods, local but abundant where it occurs. Chelsea, Hull, Stewart's bush, Beechwood. A low plant with a rosette of leaves beneath the few-flowered panicle.

ERIGERON, L. Flea-bane.

1087. E. PHILADELPHICUS, L. (Pink Flea-bane.)

Low grassy places. Ju—1. (B.)

1089. E. ANNUUS, Pers.

Fields and roadsides. July—1. (B.)

A tall coarse species with stem-leaves coarsely toothed.

1090. E. STRIGOSUS, Muhl.

Dry fields and open woods. July—1. (B.)

Slenderer than the last with stem-leaves entire. Stems rough.

1094. E. CANADENSE, L. ("Fire weed.")

Fields, open woods and waste places. July—2. (B.)

ANTENNARIA.

1097. A. PLANTAGINIFOLIA, Hook.

Fields and open woods. May—3. (B.)

ANAPHALIS.

1102. A. MARGARITACEA, Benth and Hook. (Pearly Everlasting.)

Dry fields and woods. July—2. (B.)

GNAPHALIUM, L. Cudweed.

1103. G. DECURRENS, Ives. (Sticky Everlasting.)

Dry fields. July 1.

Easily recognized by the decurrent leaves.

1108. G. ULIGINOSUM, L. (Low Cudweed.)

Waysides and in dried up places where water has stood in the spring. July—2. (B.)

1109. G. POLYCEPHALUM, Mx. (Scented Cudweed.)

Dry pastures. Near St. Louis Dam. Beyond Beechwood. Cemetery. Sep—1.

Smaller than No. 1103. Leaves not decurrent: whole plant strongly scented.

INULA, L. Elecampane.

1112. *I. Helenium*, L.

Introduced. Waysides and pastures. July—2.

AMBROSIA, Tourn. Rag weed.

1119. A. TRIFIDA, L.

Not indigenous in this locality. Low ground. Near St. Louis Dam. Major's Hill. Sep—1.

1120. A. ARTEMISIÆFOLIA, L.

Roadsides and fields. Aug—1.

XANTHIUM, Tourn. Cocklebur.

1125. X. CANADENSE, Mill. var. ECHINATUM, Gray.

X. strumarium, L.

Waste places and alluvial flats. July—1.

RUDBECKIA, L. Cone-flower.

1129. R. HIRTA, L. (Yellow Daisy.)

Fields and railway banks. Introduced from the West. Occasional in various localities, but in great abundance in a pasture at Kingsmere, P. Q.

1130. R. LACINIATA, L.

River sides and wet woods. Casselman. Rare. Aug—2.

HELIANTHUS, L. Sun-flower.

1135. H. *annuus*, L. (Garden Sun-flower.)

Frequent on waste heaps. July—1.

It is rather remarkable that we have so far found none of the native Helianthi wild in this locality.

BIDENS, L. Bur-Marigold.

1155. B. FRONDOSA, L.

Ditches and fields. Aug—1. (B.)

Some of the upper leaves trilobed.

1156. B. CONNATA, Muhl.

Margins of rivers and ponds. Aug—1. (B.)

Leaves connate. None divided.

1157. B. CERNUA, L. Smaller Bur Marigold.

Margins of ponds and streams. A low plant creeping over mud and rooting at the joints. Aug—1. (B.)

1158. B. CHRYSANTHEMOIDES, Mx. (Greater Bur Marigold.)

Alluvial flats. At the foot of Parliament Hill are some tall erect plants five feet high, with flowers and leaves like *B. cernua*, which I refer here.

1159. B. BECKII, Torr. (Water Bidens.)

In shallow water. Not uncommon in the Ottawa and Rideau rivers, but seldom flowering. July—4. (B.)

HELENIUM, L. Sneeze-weed.

1168. H. AUTUMNALE, L.

Islands and river margins. Chaudiere Islands. *(H. M. Ami.)* The Chats. *(Mrs. Chamberlin.)*

ACHILLEA, L. Yarrow.

1173. A. MILLEFOLIUM, L. (Milfoil.)

Meadows and fields. Ju--4. (B.)

A variety with pink flowers is sometimes found.

MARUTA.

1179. *M. Cotula*, DC. (May-weed.)

Introduced. Waste places. Ju—2. (B.)

CHRYSANTHEMUM, L.

1180. *C. Leucanthemum*, L. Ox-Eye Daisy.

Introduced. Meadows and cultivated ground. A troublesome weed. Ju—2.

TANACETUM, L.

1189. *T. vulgare*, L. Common Tansy.

Roadsides, an escape from cultivation. Both the type and the var. *crispum*, DC. occur here.

ARTEMISIA, L. Worm-wood.

1203. A. VULGARIS, L. (Mug-wort.)

Rocky banks and sandy fields. Aug—1.

1200. A. BIENNIS, Willd.

Not indigenous in this locality. Low ground. July—2.

1211. A. *Absinthium*, L. (Wormwood.)

Introduced. Waste places. July—2.

PETASITES, Tourn. Sweet-Coltsfoot.

1214. P. PALMATA, Gray.

Nardosmia palmata, Hook.

Low wood. Powell's Grove, Very rare. May—1.

ERECHTITES, Raf. Fire weed.

1227. E. HIERACIFOLIA, Raf.

Moist places, particularly in recently burnt clearings. Ju—2.

SENECIO, L. Groundsel.

1228. *S. vulgaris*, L. Common Groundsel.

Introduced. A rare weed in gardens. July—2.

FLORA * OTTAWAENSIS

BY

JAMES FLETCHER, F.R.S.C., F.L.S.

FLORA OTTAWAENSIS.

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It is now eight years since my first list of the plants of this district was prepared for the members of the club. This was merely a bare list of the names of 810 species collected by the writer during the summer of 1879. "This district" was then understood to mean a radius of about twelve miles from the City of Ottawa, and was defined as the country lying between the following points:—Meech's Lake, in the Chelsea Mountains, on the one side, and the Mer Bleue on the other; down the Ottawa River East Templeton and Green's Creek were included, and up the river Britannia and the islands above Aylmer. Latterly, however, by general consent of the botanists of the club, this radius has been extended to about thirty miles, so as to include Casselman on the one side and Wakefield on the other, and up the river as far as the Chats Rapids and down to Buckingham.

Previous to the appearance of the above-mentioned list there had been printed by the Ottawa Natural History Society a "List of plants collected by Mr. B. Billings in the vicinity of the City of Ottawa during the summer of 1866." This contained the names of 404 species, with the dates of their inflorescene, which appear in the present list marked (B).

The following collections had also been made previous to 1879:—By Mr. B. Billings (1866-7) which is now in the museum of the Ottawa Literary and Scientific Society; by Mr. A. H. Moore, an energetic collector, and one who added largely to our knowledge of the flora of the vicinity (1870-78.) Through the generosity of the last named gentleman this collection now forms part of my own herbarium. By Mr. Robert Whyte and Dr. H. B. Small, who began to collect about 1875, and are still active members of the botanical branch of the club. The present list contains every species up to this time found in the district and identified with certainty. Further additions will be published annually as they are reported. It has been prepared at the request of the Council, more especially as an aid for those beginning to study our flora.

The 1879 list gave merely the names of all species at that time known to have been found at Ottawa, but gave no information upon some of the most important points the local botanist requires to know about, such as the prevalence of any species in the locality, whether it be indigenous or introduced, plentiful or scarce.

Certain plants common in some localities are rare here, and *vice versa;* again, plants indigenous to Canada but not to the Ottawa district have been introduced either by accident or have escaped from cultivation. All of these facts should be made known to students or they may fall into error. It was therefore thought well, this time, to add short notes under each species, giving the general habitat, special localities and approximately the date in the year when collectors may expect to find the different species in flower.

With the exception of two or three species, all have been found by the writer in the localities mentioned, and in every case the actual specimens recorded have been carefully examined by him.

A general habitat is given for each species, and in the case of rarities exact localities are mentioned. When no special locality is given it is intended to show that the species is of common occurrence.

When no collector's name is given after a locality or the initials (J. F.) appear the writer is responsible for the record. When a plant of interest is recorded from other localities than those where the writer has found it the name of the collector is given in parentheses. In instances where a person's name is followed by an asterisk (*) it is to show that this was the first record of the plant having been discovered in the Ottawa district.

In indicating the time of the year when the plant may be looked for in flower the months have been divided into four quarters, so that when the name of a month is followed by the numbers 1, 2, 3 or 4 it shows that the plant may be expected to flower in the 1st, 2nd, 3rd or 4th quarter of the month.

Synonyms have been, for the most part, omitted, except in cases where plants appear in the list under other names than those given in Dr. Gray's "Manual." These, as well as introduced plants (whether into this district or into Canada) are printed in italics.

In compiling this new list Prof. Macoun's Catalogue, issued by the Geological and Natural History Survey of Canada, 1883, *et seq.*, has been followed, and as Canadian botanists now arrange their collections by that excellent catalogue I have thought it well to give before each species Prof. Macoun's number.

POLYPETALOUS EXOGENS.

RANUNCULACEÆ—Crow-foot Family.

CLEMATIS, L. Traveller's Joy. Virgin's Bower.

1. C. VERTICILLARIS, D.C. (Mauve-flowered Clematis).
Atragene Americana. Sims.
Creeping over rocks and low shrubs. King's and other mountains, Chelsea, P.Q. Not uncommon. May—4.

2. C. VIRGINIANA. (Common Virgin's-Bower.)
Borders of streams. Aug.—1.

ANEMONE, L. Wind Flower.

12. A. CYLINDRICA, Gray (Long-fruited Anemone).
Dry pastures. Ju.—2.

13. VIRGINIANA, L.
Rocky, open woods. There are two forms of this plant: (i) with greenish flowers like the preceding, but always with much shorter heads of fruit; and (ii) with white flowers almost as large as those of No. 15. From this latter, however, it is easily distinguished by the woolly seeds. (i) Common; (ii) on the rocks round Lake Flora, Hull, P.Q. Ju.—2. (B.)

15. A. DICHOTOMA, L. (Round-headed Anemone).
A. Pennsylvanica, L.
Along river margins and in low meadows. Ju.—2. (B.)

17. A. HEPATICA, L. (Liverwort. Blue May-flower).
Hepatica triloba, Chaix.
Dry, rocky woods. One of our earliest flowers; not quite as common as No. 18. Ap.—3 (B.)

18. A. ACUTILOBA, Lawson ("May-flower").
Dry, shady woods. Ap.—3 (B.)

THALICTRUM, Tourn. Meadow-rue.

20. T. DIOICUM, L. (Early Meadow-rue).
River banks and low woods. Ju.—1. (B.)

21. T. PURPURASCENS (Purplish Meadow-rue).

Templeton and along the Ottawa below the city (H. M. Ami*), Hull (J. F.) This species is distinguishable from *T. Cornuti* by having the anthers drooping on capillary filaments and the flowers greenish purple. On the other hand, *T. Cornuti* has white flowers, short filaments and anthers not drooping.

22. T. CORNUTI, L. (White-flowered Meadow-rue).

Islands and wet meadows and swamps; a tall, handsome plant. July—1. (B.)

RANUNCULUS, L. Crow-foot. Buttercup.

28. R. AQUATILIS, L. *v.* TRICHOPHYLLUS, Chaix (White Water Crow-foot).

Stagnant and slow-flowing waters. Ju.—1.

29. R. MULTIFIDUS, Pursh (Yellow Water-Crow-foot).

In shallow water, and creeping over mud, Malloch's Bay, Dow's Swamp and Kettle Island (J. F.), Billings Bridge (R. B. Whyte). Ju.—2.

Var. *y.* REPENS, Watson.

Leaves all round-reniform, palmately, 3—8 cleft; stems creeping in mud, Casselman and Gatineau Point (Prof. Macoun). Ju.—2.

31. R. FLAMMULA, L. *var.* REPTANS, Meyer (Smaller Creeping Crow-foot).

Mud-flats and river margins. July—1.

32. R. CYMBALARIA, Pursh (Salt-water Crow-foot).

In a low, wet meadow at Thurso, P.Q. Ju.—2.

37. R. ABORTIVUS, L. *var.* MICRANTHUS, Gray (Small-flowered Butter-cup).

Woods and Meadows. From "Macoun's Catalogue," Part III., p. 480, it would appear that our Ottawa plant is not the type of *R. abortivus*, L. May—2. (B.)

30. R. RECURVATUS, Poir (Downy Wood-Buttercup).

Woods. An attractive species with large leaves and small flowers. May—2. (B.)

45. *R. acris*, L. (Meadow Buttercup).

Introduced from Europe. Very abundant in meadows. June (B).

47. R. **Pennsylvanicus**, L. (Bristly Buttercup).
River flats and swampy woods. July—2. (B).

48. *R. repens, L.* (Creeping Crow-foot).
Introduced from Europe. Governor-General's Bay, New Edinburgh. I have not succeeded in finding the native form of this species at Ottawa.

CALTHA, L. Marsh Marigold.

54. C. **palustris**, L. (Water-Cowslip).
Margins of streams and in swamps. May—2. (B.)

COPTIS, Salisb. Gold-thread.

57. C. **trifolia**, Salisb. (Three-leaved Gold-thread).
Low woods and on hummocks in swamps. A lovely little plant with shining leaves and white, starry flowers. May—1. (B.)

AQUILEGIA, Tourn. Columbine.

59. A. **Canadensis**, L. (Wild Columbine. "Honey suckle").
Rocky woods. A beautiful plant well worth cultivation for its red and yellow flowers. May—3. (B.)

DELPHINIUM, Tourn. Larkspur.

65. *D. Consolida,* L. (Blue Field Larkspur).
Introduced from Europe in seed grain and escaped from gardens. Flowers sometimes pink or white. June—4.

ACTÆA, L. Baneberry.

73. A. **alba**, Bigelow (White-berried Cohosh).
Woods and river banks. The spikes of flowers longer and blooming a week later than those of No. 74. The conspicuous waxy white berries on their thick red pedicels render this one of our most notable berry-bearing plants. May—4. (B.)

74. A. **spicata**, L. *var.* **rubra**, Ait. (Red-berried Cohosh).
Rich woods. The flowers in a more compact head than the preceding, on longer pedicels and of a clearer white. A white-berried variety of this species frequently occurs; but it may be readily distinguished from the preceding not only by the shape of the raceme, but by the slender pedicels. May—3.

MENISPERMACEÆ.—Moonseed Family.

MENISPERMUM, L. Moonseed.

81. M. CANADENSE, L. (Canada Moonseed.)

River banks and along streams, generally in woods or thickets. July—2. (B.)

BERBERIDACEÆ.—Barberry Family.

BERBERIS, L. Barberry.

82. *B. Vulgaris*, L. (Common Barberry.)

Introduced from Europe. Occasionally found in woods, as at New Edinburgh, where the seeds were probably dropped by birds.

CAULOPHYLLUM, Michx. Blue Cohosh.

86. C. THALICTROIDES, Michx. (Papoose Root.)

Rich woods. An interesting plant with the parts of the flowers in sixes and of the same colour as the purplish foliage. These are followed by large dry berries with a beautiful blue bloom upon them. May—1. (B.)

All our plants are of a dull purple, not yellowish green, as they are stated to be west of Lake Erie.

NYMPHÆACEÆ.—Water-lily Family.

BRASENIA, Schreber.

91. B. PELTATA, Pursh, (Water-shield.)

In lakes and rocky pools.

Rideau River at Black Rapids and McLaurin's Bay, East Templeton (J. F.), Lake Winedago, (*Dr. H. B. Small*).

NYMPHÆA, Tourn. Water-lily.

93. N. TUBEROSA, Paine, (Tuber-bearing Water-lily.)

Rivers and Lakes. This is the common white water-lily of this locality. The flowers are less double and have much less scent than the next. July.

94. N. ODORATA, Ait. (Sweet-scented Water-lily.)

Slow streams and lakes. Rideau River. Meech's Lake.

Flowers generally smaller than in No. 93. Rare. July (B.)

NUPHAR, Smith. Yellow Pond-lily.

95. N. ADVENA. Ait. (Common Yellow Pond-lily.)
Streams and lakes. Ju.—1. (B.)

97. N. ADVENA + KALMIANA, Caspary.
N. rubrodiscum, Morong.

This is a very beautiful hybrid between *N. advena* and *N. Kalmiana.* It is intermediate in size and appearance between *advena* and *Kalmiana.* The floating leaves are purple beneath with slender petioles. The submerged membranaceous leaves were freely produced and like those of *N. Kalmiana.* The flowers expand 1½ inches, have 6 sepals and a bright velvety crimson—10-15 rayed stigmatic disk. The perfect fruit, which is seldom produced, bears a closer resemblance to that of *N. Kalmiana* than to that of *N. advena,* being almost globose with a constriction beneath the stigma.

Leamy's Lake and Gilmour's Piling-grounds. July—1.

98. N. KALMIANA, Ait. (Least Yellow Pond-lily.)
N. luteum, var *pumilum.* Gray's Manual, 57.

Streams and lakes. Leamy's Lake, Gilmour's Piling-grounds (J.F.). Green's Creek. (*B. Billings.*) July—1. (B.)

A charming little species. Quite distinct, I believe, from the European *N. luteum,* var *pumilum.*

SARRACENIACEÆ.—Pitcher-Plants.

SARRACENIA, Tourn.

99. S. PURPUREA, L. (Side-saddle Flower).

Peat bogs. Lake Flora, Hull, and Mer Bleue, abundant. A few plants in the Race-course Swamp, Bank Street Road. One of our most interesting Canadian plants. Ju.—2.

Used in Lower Canada as a remedy for small-pox.

———— var HETEROPHYLLA, Torrey.

This, I think, is merely an albino form of *S. purpurea.* I have found three plants at Lake Flora, Hull. The leaves are pale green without red veins, and the flowers yellowish white. Ju.—2.

PAPAVERACEÆ.—Poppy Family.

PAPAVER, L. Poppy.

100. P. *somniferum*, L. Opium Poppy.

An escape from cultivation occasionally found in wheat-fields and upon rubbish heaps. July—2.

101. P. *Rhœas*, L.

Introduced with seed wheat at Billings Bridge. Occasionally found by road-sides, but nowhere permanently introduced. July.

SANGUINARIA, L. Blood-root.

104. S. CANADENSIS, L. (Blood-root.)

Roads and clearings. One of our earliest and most beautiful spring flowers. Largely used by the Indians both as a dye-plant and medicinally. April—4.

CHELIDONIUM, L. Celandine.

105. C. *majus*, L. (Celandine.)

Introduced. Occasionally found by way-sides as at Stewarton and New Edinburg. June.

FUMARIACEÆ.—Fumitory Family.

ADLUMIA, Raf. Climbing Fumitory.

106. A. CIRRHOSA, Raf. (Cypress Vine.)

Rocky woods. Common. A most beautiful creeper with delicate foliage and a profusion of pink pendent blossoms, flowering all the summer. Sometimes creeping over bushes 10 or 12 feet high. Ju.—2.

DICENTRA, Bork.

107. D. CUCULLARIA, DC. (Dutchman's Breeches.)

Rich woods. May—1. (B.)

108. D. CANADENSIS, DC. (Squirrel Corn, " Wood Hyacinth.")

Rich woods. May—2. (B.)

CORYDALIS, Vent.

110. C. GLAUCA, Pursh. (Pale Corydalis.)

Hill sides and amongst rocks. May—2. Flowering all the summer. B,

111. C. AUREA, Willd. (Golden Corydalis.)

Hill sides and rocky woods. May—2. (B.)

CRUCIFERÆ.—Mustard Family.

NASTURTIUM, R. Br. Cress.

114. *N. officinale*, R. Br. (Water-cress.)

Springs and brooks. Billings Bridge. Chelsea. New Edinburgh, &c. June. (B.)

115. N. PALUSTRE, DC. (Marsh-cress.)

Low ground. A smooth species with pods more than twice as long as broad. Ju.—2. (B.)

——— var. HISPIDUM, Fisch. & Mey.

Low ground. A rougher plant than the above with round pods. Ju.—2.

116. N. AMPHIBIUM, R. Br.

Low ground. A coarser and larger plant than the above, the stem generally decumbent and rooting at the base, Biennial or perennial with pods shaped like those of *N. palustre*. Ju.—2.

119. N. LACUSTRE, Gray. (River-cress.)

Margins of rivers. Malloch's Bay, Ottawa, and abundant in the Nation river at Casselman. An interesting plant with the submerged leaves much laciniated. The flowers and fruit are not very freely produced ; but when mature the leaves fall off, throw out roots and become new plants. Ju.—2.

120. N. *Armoracia*, Fries. (Horse Radish.)

An escape from cultivation. Occasionally found on waste places in the suburbs of the city.

DENTARIA, L. Tooth-wort.

121. D. DIPHYLLIA, Michx. (Crinkle-root.)

Rich woods. May—2. (B.)

122. D. LACINIATA, Muhl. (Cut-leaved Tooth-wort.)

Rich woods. A very local species, so far only found at Beechwood, near the S.W. corner of the cemetery. May - 1. (B.)

CARDAMINE, L. Bitter Cress.

124. C. RHOMBOIDEA, DC.

River bank, Hull, P.Q. May—2. The plant I have referred here is an erect species with almost sessile leaves up the stem

125. C. ROTUNDIFOLIA, Michx.

Springy wood. Billings Bridge. This is a weak-stemmed few-flowered plant with angular root leaves upon long petioles. Stem fleshy at the base. May—3.

129. C. PRATENSIS, L. (Ladies' smock. "Cuckoo-pint.")

Peat-bogs and wet meadows. Dow's swamp. Billings Bridge. Beechwood. Lake Flora, (J. F.) ; Janeville, (R. B. Whyte). The Canadian plant, as noticed in Macoun's catalogue, is more slender than the European, and also white-flowered. Young plants are produced in great abundance from the leaflets which fall off and float on the top of the water. May—2. (B.)

130. C. HIRSUTA, L. (Small Bitter cress.)

Low ground and springy woods. An inconspicuous plant with a very inappropriate name, being almost glabrous. June—2.

ARABIS, L. Rock-Cress.

135. A HIRSUTA, Scot. (Hairy Rock-cress.)

Rocky open woods and pastures. Little Chaudiere. Brittannia. Hull. Aylmer. Chelsea, &c. May—4.

138. A. DRUMMONDII, Gray. (Tower-mustard.)

Rocky pastures. A large distinct species. May—4. (B.)

140. A. PERFOLIATA, Law. (Smooth Tower-mustard.)

Sandy woods and pastures. A tall slender plant with yellowish flowers and leaves only apparently, not really, perfoliate. June —2.

141. A LÆVIGATA, Poir.

Mountain side. King's Mountain, Chelsea, P.Q. June.

BARBARÆA, R. Br. Winter-cress.

145. B. VULGARIS, R. Br. (Yellow Rocket.)

On rocks and by waysides. Lovers' Walk. New Edinburgh. Billings Bridge. Ju.—3.

———— var. STRICTA, Regel (Native winter-cress.)

Swampy woods. Beechwood. A much less conspicuous plant than the type, with slender stem and small flowers. Ju.—2.

ERYSIMUM, L. Treacle Mustard.

146. E. CHEIRANTHOIDES, L. (Worm-seed Mustard.)

Everywhere. June. (B.)

SISYMBRIUM, L. Hedge Mustard.

150. *S. officinale*, Scop.

Roadsides. July—1. (B.)

BRASSICA. Tourn. Cabbage. Mustard.

159. *B. Sinapistrum*, Boiss. (Wild Mustard. "Charlock.")

Cultivated ground. A most troublesome and persistent weed in many parts of Canada. Pods knotty, smooth, one-third consisting of a stout two-edged and one-seeded beak. Seeds reddish black. June. (B.)

160. *B. alba*, Gray. (Garden Mustard.)

A garden escape. Easily known by its bristly pods, more than half of which consist of the one-seeded beak. Seeds yellow. July—1.

161. *B. nigra*, Koch. (Black Mustard.)

Roadsides. Scarce at Ottawa. Pods smooth, four-cornered, erect on appressed pedicels. Seeds dark brown. June.

CAMELINA, Crantz. False Flax.

191. *C. sativa*, Crantz.

An occasional weed in fields of grain. Ju.—2.

NESLIA, L.

2107. *N. paniculata*, L.

Rarely introduced with bird seed. A small plant with sparse stellate-pubescence, small bright yellow flowers and round pods. Ju.—3.

CAPSELLA, Vent. Shepherd's Purse.

197. *C. Bursa-pastoris*, Mœnch.

Everywhere around inhabited localities. May. (B.)

THLASPI, Tourn. Penny-cress.

199. *T. arvense*, L. (Mithridate Mustard.)

Waste places. Ju.—1.

LEPIDIUM, L. Pepper-wort.

202. *L. sativum*, L. (Garden-cress.)

A garden escape frequently found in waste places.. Ju.—2.

207. L. VIRGINICUM, L.

Rocky pastures. Ju.—1. (B.)

RAPHANUS, L. Radish.

213. *R. sativus*, L. (Garden Radish.)

Introduced. Borders of fields and way sides. Ju.—1.

VIOLACEÆ—Violet Family.

VIOLA, L. Heart's-Ease. Pansy.

229. V. BLANDA, Willd. (Small Sweet White Violet)

Damp woods. May—1. (B.)

230. V. RENIFOLIA, Gray. (Kidney-leaved Violet.)

Damp woods and swamps. Sometimes confounded with the above. The leaves, however are pubescent and more or less kidney-shaped, one always decidedly so, and the flowers are scentless. May—2.

234. V. SELKIRKII, Pursh. (Large-spurred Violet.)

Damp, shaded rocks. Our earliest Blue Violet. A very distinct species, easily recognized by the leaves being smooth beneath and sparsely hairy above, and by the large blunt spar. Hemlock Lake, Beechwood, Chelsea. May—1.

235. V. CUCULLATA, Ait. (Hooded Violet.)

Damp woods or meadows. A most variable species, both as to flowers and foliage. There are, however, two veay distinct forms: (1) A large plant with blue flowers and very pubescent leaves; and (2) a smaller plant growing in meadows or beside water, with large violet flowers and almost smooth leaves. May—3. (B.)

240. V. CANINA, L., var. SYLVESTRIS, Regel. (Dog Violet.)

Woods and pastures. May—2. (B.)

241. V. ROSTRATA, Muhl. (Long-spurred Violet.)

Governor-General's Bay, New Edinburgh. Ju.—1.

242. V. CANADENSIS, L. (Canada Violet.)

Rich woods. A charming species, flowering in May and November. (B.)

243. V. PUBESCENS, Ait. (Down Yellow Violet.)

Rich woods. A lovely plant, with golden yellow flowers and fine foliage. There are two forms.

var. *eriocarpa*, Nutt, has the pods covered with woolly white pubescence. This is probably the type of the species. May—3. (B.)

———var. SCABRIUSCULA, T. & G.

In this the pods are perfectly smooth and the leaves almost so. Some forms of this variety resemble closely the western *V. glabella*, Nutt. May—3.

247. V. *tricolor*, L., var. *arvensis*, Ging. (Wild Pansy.)
Cultivated ground. Billings Bridge. Hintonburgh. Ju.—1.

POLYGALACEÆ—Milk-wort Family.

POLYGALA. Milk-wort.

251. P. SENEGA, L. (Seneca Snake-root.)
Rocky banks. Not uncommon. Ju.—1. (B.)

253. P. PAUCIFOLIA, Willd. (Fringed Polygala.)
Dry, open woods. A lovely little flower. Ironsides (J. F.), near St. Louis Dam (H. M. Ami*). May—3. (B.)

CARYOPHYLLACEÆ—Pink Family.

SILENE, L. Catchfly. Campion.

255. *S. inflata*, Smith. (Bladder Campion.)
Introduced. Waysides and grain fields. July—2. (B.)

258. S. ANTIRRHINA, L. (Sleepy Catchfly.)
Sandy and rocky banks. Ju.—1.

560. *S. Armeria*, L. (Sweet-William Catchfly.)
A garden escape. Billings Bridge, and occasional in waste places. July. (B.)

261. *S. noctiflora*, L. (Night-flowering Cathfly.)
Introduced. An abundant weed in fields and gardens. Ju.—3. (B.)

LYCHNIS, Tourn. Lychnis, Cockle.

268. *L. Githago*, Lam. (Corn-Cockle.)
Introduced. Grain fields. July—2.

269. *L. Vespertina*, Sibth. Evening Lychnis.
Introduced with grass seed. July.

1237. S. AUREUS, L.
Rocky woods and banks. Ju—2. (B.)
ARCTIUM. Burdock.
1251. *A. Lappa*, L. Common Burdock.
Lappa officinalis All. var. *major*, Gray's Manual.
Introduced. Waysides. July—4. (B.)
CNICUS, Vaill. Thistle.
1254. *C. lanceolatus*, Hoffm. (Scotch Thistle.)
Cirsium lanceolatum, Scop.
Naturalized. Roadsides, pastures and woods. July—2. (B.)
1259. C. MUTICUS, Pursh.
Cirsium muticum, Mx.
Swamps. Ange Gardien. *(H. M. Ami.)* Templeton. Buckingham. (*J. F.*) July—4.
1262. *C. arvensis*, Pursh. ("Canada Thistle.")
Cirsium arvense, Scop.
Naturalized throughout the country. Ju—3. (B.)
ONOPORDON, Vaill. (Scotch Thistle.)
1266. *O. acanthium*, L.
Introduced. Roadsides. Montreal Road. (*R. B. Whyte.*) July—4. Called "Scotch Thistle," but not a native of Great Britain.
CENTAUREA, L. Star Thistle.
1269. *C Cyanus*, L. (Blue bottle. Corn-flower.)
Introduced. In wheat fields, Billings Bridge. July—1.
CICHORIUM, Tourn. Succory, Endive.
1271. *C. Intybus*, L. (Chicory.)
Introduced. Abundant in ditches and by way-sides. Ju—3.
LAMPSANA, Tourn. Nipple-wort.
1276. *L. communis*, L.
A weed in gardens and by way-sides. (*H. B. Small.*)
HIERACIUM, L. Hawkweed.
1288. H. CANADENSE, Mx.
River banks and in thickets. Aug.—1.
1289. H. SCABRUM, Mx.
Sandy fields and woods. Aug.—1.
TARAXACUM, Hall. Dandelion.
1308. *T. officinale*, Weber.
Taraxacum Dens-leonis, Desf.
Completely naturalized throughout Canada. May—2. (B.)
LACTUCA, L. Lettuce.
1309. L. CANADENSIS, L.
Damp woods. A tall, wand-like plant. Stem thick, hollow and very leafy, smooth. Flowers generally pale yellow, in a long, narrow naked panicle. Aug.—1. (B.)
1310. L. INTEGRIFOLIA, Bigel.
L. Canadensis var. *integrifolia*, T. & G.
Parliament Hill. Leaves smooth, undivided, and generally entire. Rare. Aug.—3.

It seems to me that neither this nor the next present sufficient characters to warrant their being separated from *L. Canadensis* as anything more than varieties.

1311. L. HIRSUTA, Muhl.

L. Canadensis var. *sanguinea*, T. & G.

Railway banks and rocky woods, not uncommon. Leaves all runcinate-pinnatifid, hirsute on the mid-ribs beneath. Flowers purplish-yellow. Aug.—2.

1314. L. LEUCOPHÆA, Gray.

Mulgedium leucophæum, D. C.

Low, rich woods. A tall plant much like *L. Canadensis*, but with brownish pappus. Aug.—2.

1315. *L. sativa*, L. (Garden Lettuce.)

Occasionally found on waste heaps; but never permanently established.

PRENANTHES, L. Rattlesnake-root.

1316. P. ALBA, L. (White Lettuce.)

Nabalus albus, Hook.

Rocky woods. An interesting plant with glaucous foliage and purplish-red stems, peduncles, and involucres. Flowers white and pappus deep brown. Aug.—2. (B.)

1318. P. ALTISSIMA, L.

Nabalus altissimus, Hook.

Woods. A tall, slender plant with yellow flowers and dusky pappus. Aug.—2. (B.)

SONCHUS, L. (Sow Thistle.)

1321. *S. oleraceus*, L. (Common Sow-thistle.)

Cultivated ground and waste places. Annual. Aug.—1. Leaves clasping by a heart-shaped base, the auricles acute.

1322. *S. asper*, Vill. (Prickly Sow-thistle.)

With the last, but commoner. Leaves more prickly, the auricles of the base rounded.

1323. *S. arvensis*, L. (Perrennial Sow-thistle.)

At the base of Parliament Hill is a large and rapidly increasing patch of this plant, which is now becoming a troublesome weed in Canada. It has also been noticed at Chelsea and at Billings Bridge at the edges of fields. Aug.—1.

TRAGOPOGON, L. Goat's-beard.

1326. *T. pratensis*, L. (Yellow Goat's-beard.)

Along the railway near the St. Louis Dam. A few plants have been found at the above locality for the last 12 years. Flowers, large, yellow.

1327. *T. porrifolius*, L. (Salsify.)

An escape from cultivation. In a hay-field at Billings Bridge and occasional on waste heaps. Flowers purple.

LOBELIACEÆ.

LOBELIA, L.

1332. L. CARDINALIS, L. (Cardinal Flower.)

River-sides and along streams common. July—4. (B.) This is undoubtedly one of our finest Canadian wild flowers, and has been cultivated in Europe for many years.

1337. L. INFLATA, L. (Indian Tobacco.)

Sandy fields. July—4. (B.)

CAMPANULACEÆ—Bell-wort Family.

CAMPANULA.

1342. *C. rapunculoides*, L.

Waste ground. Introduced. For many years there was a large patch of this persistent plant on the vacant lot where the rooms of the Ottawa Literary and Scientific Society now stand.

1344. C. ROTUNDIFOLIA, L. (Hare-bell.)

Crevices of rocks. Not uncommon. June—2. (B.)

1345. C. APARINOIDES, Pursh. (Rough Bell-flower.)

Marshes and along streams. Common. A slender plant, the weak stems rough with short spines on the angles. Flowers nearly white. July—2. (B.)

VACCINIACEÆ.—Blueberry Family.

GAYLUSSACIA, HBK. Huckleberry.

1350. G. RESINOSA, T. & G.

Sandy fields and swamps. Race-course swamp. Aylmer. East Templeton. June—1. Whole plant covered with resinous globules. Fruit black.

VACCINIUM, L. Blue-berry.

1352. V. PENNSYLVANICUM, Lam. (Early Blueberry.)

Borders of swamps and hill-sides. Chelsea Mountains. Aylmer. Race course on Bank street road. May—2.

A smooth dwarf shrub with oblong, serrate, leaves, which are smooth on both sides. Flowers cylindrical bell-shaped, white tinged with red. Our earliest blue-berry ripe by the middle of July.

1353. V. CANADENSE, Kalm.

Swamps, sandy fields and hill-sides, with the last, not uncommon. May—2. A dwarf shrub, the whole plant downy. Flowers small, green tinged with red.

1355. V. CORYMBOSUM, L. (Swamp Blue-berry.)

Swamps and mossy rocks. May—2.

Under this name are grouped several very different varieties.

Var. ATROCOCCUM is a high bush found in swamps with leaves entire and downy underneath, as also are the branchlets. Flowers white; berries black without bloom.

Var. PALLIDUM, Gray, is a low shrub found growing in crevices of rocks along the Gatineau river and at Aylmer. The whole plant glaucous, leaves smooth and serrulate.

1358. V. CÆSPITOSUM Mx. (Dwarf Billberry.)

Mossy rocks. Kirk's Ferry. June.—1.

A dwarf shrub 2 or 3 inches in height with thin leaves and blue berries.

OXYCOCCUS, Pers. Cranberry.

1365. O. VULGARIS, Pursh. (Small Cranberry).

Vaccinium Oxycoccus, L. Peat-bogs. Common. June—2.

Easily distinguished from the next by its small revolute leaves and terminal fascicle of flowers.

1366. O. MACROCARPUS. Pursh. (Large American Cranberry).

Vaccinium macrocarpon, Ait.

Peat bogs, common. June—1. Larger than the last in all its parts. Flowers lateral.

CHIOGENES, Salisb. Creeping Snowberry.

1367. C. HISIPIDULA, T. & G. (Capillaire).

Creeping over decayed logs or hummocks in cedar swamps. May —2. (B). A beautiful little creeper with large, white, waxy aromatic berries.

ARCTOSTAPHYLOS.

1370. A. UVA-URSI, Spreng. (Bearberry. Kinnikinnick).

Rocky or sandy soil. May 2.

GAULTHERIA, L. Aromatic Wintergreen.

1374, G., PROCUMBENS. (Tea-berry).

Sandy fields and woods, July—4. A lovely little plant with beautiful white pendent flowers, beneath a rosette of shining leaves. The bright cherry-red berries (formed of the calyx), remain on the stems all the winter.

CASSANDRA, Don. Leather leaf.

1376.C . CALYCULATA, Don.

Peat-bogs. Common. May—1.

The beautiful but rather inconspicuous white flowers are produced in great profusion beneath the many slender branches, from buds formed the previous summer.

EPIGÆA. Mayflower.

1382. E. REPENS, L. (Trailing Arbutus. Mayflower.)

Rocky islands and banks, sandy borders of swamps. Gilmour's Grove, Chelsea. Aylmer. May—1.

A most lovely flower with exquisite scent. This is the true Mayflower; altogether that name is applied to a great many other spring flowers in different localities.

ANDROMEDA, L.

1383. A. POLIFOLIA, L.

Peat-bogs. Mer Bleue. Hull. Chelsea. May—3.

Leaves thick and white beneath with strongly revolute margins.

KALMIA.

1393. K. ANGUSTIFOLIA, L. (Lambkill, Sheep Laurel.)

Peat-bogs. July—1. (B.)

A showy shrub bearing a profusion of lateral corymbs of pinkish-crimson flowers.

1394. K. GLAUCA, Ait. (Pale Laurel.)

Peat-bogs. June—2. (B.)

Leaves almost sessile, branchlets two-edged, few-flowered corymbs terminal. Flowers paler and larger than in the last species.

LEDUM.

1396. L. LATIFOLIUM, Ait. (Labrador Tea.)

Peat-bogs. Common. May—4.

A charming shrub with terminal umbel-like clusters of white flowers. Leaves with a rusty woolly pubescence *beneath glandular* and aromatic.

PYROLA, L. Wintergreen.

1410. P. SECUNDA, L. (Green-flowered Pyrola.)

Swamps and rich woods. A pretty plant with the pale green flowers all turned to one side of the stem. July—1. (B)

1411. P. CHLORANTHA, Schwartz. (Yellow-flowered Pyrola.)

Dry open woods. Rather uncommon. Rockcliffe. Stewart's Bush. Aylmer. Chelsea. Leaves thick, dull green with pale veins. Flowers large and greenish yellow. July—1.

1412. P. ELLIPTICA, Nutt. (Shin-leaf.)

Rich woods. A lovely flower with large thin leaves and white flowers like lilies of the valley. June—2.

1413. P. ROTUNDIFOLIA, L. (Round-leaved Wintergreen.)

Sandy woods. This is a very variable species. What I take for the type has white flowers like *P. elliptica*, but thick roundish leaves and a more robust habit. Beechwood (*Dr. H. B. Small*). Billings Bridge. Hull. Aylmer. Chelsea. Rather uncommon. July—1. (B)

——————— var. INCARNATA, D.C.

Peat-bogs. Common. Leaves thinner and smaller. Flowers pink. June—2.

———— var. ASARIFOLIA, Hook.

Damp woods. Rare. Aylmer. Leaves round-reniform or oblate. Calyx-lobes almost triangular, flowers white or tinged with pink. July—1.

MONESES, Salisb. One-flowered Pyrola.

1416. M. UNIFLORA, Gray.

Pyrola uniflora, L.

Peat bogs and low woods. One of our most charming flowers. The leaves are small and close to the ground; from their centre is thrown up one large white pendent flower of great beauty and delicious scent. Dow's Swamp. Kingsmere. Mer Bleu. Casselman. July—1. (B)

CHIMAPHILA, Pursh. Pipsissewa.

1417. C. UMBELLATA, Nutt. (Prince's Pine.)

Dry coniferous woods. Uncommon. This is another plant of great beauty. The evergreen leaves are thick and shining and borne in a whorl, or are slightly scattered along the short stems. Flowers borne in a corymb above the leaves. Petals pink, anthers violet, stigma green.

PTEROSPORA, Nutt. Pine-drops.

1418. P. ANDROMEDEA, Nutt.

Pine woods. This is a very local plant. Along the bank of the Gatineau between Ironsides and Chelsea, upon a heavy clay bank, beneath pines, it is very abundant. With the exception of a single plant found at Rockcliffe by Mr. A. J. Forward, this is the only locality so far discovered in this district. It is a curious plant, consisting of a stout, pinkish-white, erect, clammy-pubescent, fleshy stem about two feet in height, bearing at the base lanceolate scales instead of leaves, and above nodding white flowers like those of *Andromeda*, in a long bracted raceme. Root, a mass of fleshy fibres. It is supposed to be a parasite on the roots of pines.

MONOTROPEÆ.—Pipe-wort Family.

MONOTROPA, L. Pine-sap.

1422. M. UNIFLORA, L. (Indian Pipe.)

Dry woods. Common. June—4. A parasite upon roots of trees. The beautiful white single-flowered alabastar-like stems are thrown up in a cluster from a ball of matted fibrous roots. Flowers nodding, becoming erect as the fruit ripens.

PRIMULACEÆ.—Primrose Family.

TRIENTALIS, L. Chickweed Wintergreen.

1441. T. AMERICANA, Pursh. (Star-flower.)

Low woods. Common. May—2. (B). A delicate beautiful plant.

STEIRONEMA, Raf. Loosestrife.

1443. S. CILIATUM, Raf.

Lysimachia ciliata, L.

River sides and damp thickets. Common. July—1. (B)

LYSIMACHIA, L. Loosestrife.

1447. L. STRICTA. (Racemed Loosestrife.)

Rocky river-sides and damp thickets. Common. July—1. (B)

1449. *L. nummularia*, L. (Moneywort.)

A garden escape. Parliament hill. A pretty trailing perennial with large golden yellow flowers borne singly in the axils of the leaves.

1450. L. THYRSIFLORA, L. (Tufted Loosestrife.)

Naumburgia thyrsiflora, Reich.

Cold wet thickets. Common. May—4. (B)

ANAGALLIS, L. Pimpernel.

1452. *A. arvensis*, L. Shepherd's Weather-glass.)

Introduced. Wheat fields. Uncommon. July—1. A small procumbent plant with bright scarlet flowers, which open in bright weather but quickly close before rain.

———————— var. *cerulea*. Benth.

Introduced with Canary seed. This form, which is probably introduced from Germany, is more frequent than the type. It is a larger and coarser plant with purplish blue flowers. Aug.—1.

SAMOLUS, L. Water Pimpernel.

1454. S. VALERANDI, L. var. AMERICANUS, Gray.

River side. Rideau River, at the rifle range. Very rare. July—3. A smooth branched herb four to eight inches in height, with alternate entire leaves and small white flowers in racemes. Corolla bell-shaped, 5-cleft, with small processes (sterile filaments) in the sinuses. True stamens on the tube of the corolla, included.

OLEACEÆ.—Olive Family.

FRAXINUS, L. Ash.

1455. F. AMERICANA, L. White Ash.

Rich woods. A fine and valuable tree. Frequently three or four stems from the same root. There is a common variety of this species with the fruit and young shoots purple. The seeds germinate the first spring after sowing.

1456. F. PUBESCENS, Lam. (Red Ash, Rim Ash, River Ash.)

Banks of rivers and lakes. A fine tree with branchlets and petioles velvety downy; seed germinating the first year. May—3. (B.) This species is sometimes difficult to distinguish from the last, the distinguishing characters not always being well marked. It is generally a smaller tree, the pubescence on the petioles and on the branchlets, although it often disappears late in the season on some trees, is always present on the young shoots. The seed is less swollen, and smaller in proportion to the wing of the samara, than in *F. Americana.* In growing several thousands from the seed I notice that *F. Americana* takes a few days longer to germinate, and leafs out a few days later in the spring. With seedlings sown in rows side by side *F. pubescens* has made in two years twice the growth of *F. Americana.*

1460. F. SAMBUCIFOLIA, Lam. (Black Ash, Water Ash.)

Swamps and low ground. May—3. (B.) A smaller tree than 1455 and 1456. Easily distinguished by its fruit, which is winged all round the seed. The seed does not germinate until the second spring after it is sown. The tough stringy wood is largely used for making baskets and fruit boxes.

APOCYNACEÆ.—Dogbane Family.

APOCYNUM, Linn. Dogbane, Indian Hemp, Lesser Milkweed.

1462. A. **ANDROSÆMIFOLIUM**, Linn. (Spreading Dogbane.)

Rocky woods and fields. Common. June—2. (B.) An interesting perennial. The frequently forking branches bear a profusion of small sweetly-scented open bell-shaped flowers (4 lines broad), from each of which is produced a pair of slender pods from three to four inches in length.

1463. A. **CANNABINUM**, L. (Indian Hemp.)

Sandy fields and on islands, in lower ground than the last. June—2. (B.) A more erect plant, with smaller white flowers borne in close many-flowered cymes.

ASCLEPIADACEÆ.—Milkweed Family.

ASCLEPIAS, L. Milkweed, Silkweed.

1465. A. **INCARNATA**, L. (Swamp Milkweed.)

Borders of rivers and lakes. Common. July—1. (B.) A tall handsome plant with rose-purple flowers scented like vanilla, and smooth pods. The fibre in the stem of this plant is very tough and it should make a good fibre plant.

1467. A. **CORNUTI**, Decaisne. (Milkweed.)

Fields and borders of thickets. Common. July—2. (B.) A handsome and sturdy wayside weed.

GENTIANACEÆ.—Gentian Family.

GENTIANA, L. Gentian.

1497. G. **ANDREWSII**, Griseb. (Closed Gentian.)

River sides and moist ground. Common. Aug.—2. (B) A very handsome species with deep green glossy foliage, and large bluish-purple flowers, over an inch in length, borne in a terminal cluster and in the axils of the upper leaves.

MENYANTHES, L. Buckbean.

1506. M. **TRIFOLIATA**, L.

Bogs. Not uncommon. May—3. (B)

POLEMONIACEÆ.—Polemonium Family.

PHLOX, L.

1510. P. DIVARICATA, L. (Blue Phlox.)

Damp woods. Casselman. Rare. Ju.—2. A delicate plant well worthy of cultivation.

HYDROPHYLLACEÆ.—Waterleaf Family.

HYDROPHYLLUM, L. Water Leaf.

1536. H. VIRGINICUM, L.

Damp woods. Casselman. Ju—2. A coarse weedy plant.

BORRAGINACEÆ. Borage Family.

CYNOGLOSSUM, L. Houndstongue.

1549. C. *officinale*, L. (Common Houndstongue Burr.)

Introduced from Europe. Common. Ju—1, (B). A troublesome weed.

1550. C. VIRGINICUM, L. (Blue Comfrey.)

Woods. Rather rare. King's Mountain. Green's Creek (*J. F.*) Britannia (*R. B. Whyte*). Ju—1. A showy plant with delicate blue flowers.

ECHINOSPERMUM. Swartz. Stickseed.

1555. E. VIRGINICUM, Lehm. (Beggar's Lice.)

Cynoglossum Morisoni.

Rich open woods. Common. July—2.

1556. *E. Lappula*, Lehm. (Small Sheep Burr.)

Introduced from Europe. A troublesome weed. Ju—2. (B).

MYOSOTIS, L. Forget-me-not.

1576. *M. laxa*, Lehm.

River side. Billings Bridge. New Edinburgh. Gatineau Point. July—1. A slender plant with small flowers.

LITHOSPERMUM, L. Gromwell.

1581. *L. arvense*, L. (Corn Gromwell.)

Introduced. Occasional with grain, but not persistent. Ju—2.

1582. *L. officinale*, L. (Common Gromwell.)

Introduced and very abundant in rocky pastures. Ju—2. (B).

1585. L. HIRTUM, Lehm. (Hairy Pucooon.)

River side in sand. On the banks of the Ottawa above Aylmer. Rare. (Mrs. Chamberlin) June—3. Flowers bright orange, woolly inside.

SYMPHYTUM, L. Comfrey.

1590. *S. officinale*, L. (Common Comfrey.)

Introduced. Rideau rifle range. Buckingham. Aylmer. July—2.

LYCOPSIS, L. Bugloss.

1591. *L. Arvensis*, L. (Small Bugloss.)

Introduced. Rare in sandy fields. Theodore street and at Billings Bridge. June—2.

ECHIUM, L. Viper's Bugloss.

1592. *E. vulgare*, L. (Blue weed.)

Introduced. Gradually becoming a troublesome weed. Ju—2.

CONVOLVULACEÆ. Bindweed Family.

IPOMÆA, L. Morning Glory.

1594. *I. purpurea*, L. (Common Morning Glory.)

A garden escape, frequently found in waste places.

CONVOLVULUS, L. Bindweed.

1597. C. SPITHAMÆUS, L. (Low Bindweed.)

Calystegia spithamœa, Pursh.

Clay banks, sandy shores, and rocky islands. Rare. Bank of the Ottawa below Rockcliffe. Kettle Island. and formerly on the rocky island opposite the end of Bank street. A very attractive plant with short stems and large pure white flowers. July—1.

1598. *C. sepium*, L. (Bracted Convolvulus. Hedge Bindweed.)

Calystegia sepium, R. Br.

Introduced. Chelsea Road, one locality. July—1. This is evidently the European form, which has in some way got introduced. It climbs up over high bushes fifteen or twenty feet from the ground and has snow-white flowers.

——— var. AMERICANUS, Sims.

River sides, trailing over sand or low plants. Distinguished from the type by the short stems, obtuse bracts and pink flowers. July—1. (B)

1599. *C. arvensis*. (Small Bindweed.)

Introduced. Cummings Bridge. Billings Bridge. Parliament Hill. The original plants here are very persistent, but it does not seem to spread much by seed. July—1.

CUSCUTA, L. Dodder.

1603. C. GRONOVII, Willd.

Low open woods and river sides. Trailing over low plants, particularly *Eupatorium ageratoides*. Not uncommon. July—2. A curious and interesting parasite, having bright orange stems, and, for the genus, large white flowers borne in close clusters at intervals along the stems. The only species of the genus so far detected in this district.

SOLANACEÆ, L.—Nightshade Family.

SOLANUM, L.

1608. *S. nigrum*, L. (Common Nightshade.)

Introduced. Common in low ground. July—1. (B)

1609. *S. Dulcamara*, L. (Bittersweet.)

Introduced. Rare in low woods. Billings Bridge and near the Rideau rifle range. June—2.

1610. *S. rostratum*, Dunal.

Introduced. This is a curious case of persistence. *S. rostratum* is a Colorado plant, and interesting as being in all probability the original food plant of the Colorado potato beetle. It can generally be found every year in some part of the city in waste places, but nowhere in abundance. First noticed by Mr. J. A. Guignard in 1876.

LYCOPERSICUM, Mill. Tomato.

1612. *L. esculentum*, Mill.

Introduced. The tomato in some of its many cultivated forms is always to be found growing on waste heaps and by waysides.

PHYSALIS, L. Ground Cherry.

1613. *P. Peruviana,* L. (Cape Gooseberry.)
Introduced. Waste heaps. Occasionally found, but not persistent. July—4.

1614. P. GRANDIFLORA, Hook.
Rocky woods. Not common. Generally found after woods have been burnt over. June—3. A showy plant with large pure white flowers spotted in the centre with greenish yellow.

1615. *C. pubescens,* L. (Downy Physalis.)
Introduced. Occasionally found on waste heaps. Not persistent. July—1.

NICANDRA, Adans. Apple-of-Peru.

1618. *N. physaloides,* Gærtn.
Introduced. Often found on waste heaps and by roadsides in the city. A fine plant with spreading branches and pretty lavender-blue flowers, which are followed by a large dry berry enclosed in the enlarged calyx-lobes. July—1.

DATURA, L. Thorn-apple.

1620. *D. Stramonium,* L. (Thorn-apple.)
Introduced. Waste places. A rank-smelling, poisonous and narcotic weed. Not uncommon. Flowers white, followed by large 4-valved prickly pods. July—4. (B)

1621. *D. Tatula, L.* (Jamestown Weed.)
Introduced. Less common than 1620. A taller plant with purple stems and much larger pale violet-purple flowers, emitting a most sickening odour when handled or bruised. July—4.

HYOSCYAMUS, L. Henbane.

1622. *H. niger,* L. (Black Henbane.)
Introduced. July—1. (B.) Not common, but often appearing. A coarse, clammy and strongly scented plant with yellow, purple-veined, flowers.

NICOTIANA, L. Tobacco.

1623. *N. rustica*, L. (Wild Tobacco.)

Introduced. A coarse weed with green flowers.

SCROPHULARIACEÆ.—Fig-wort Family.

VERBASCUM, L. Mullein.

1625. *V. Thapsus*, L. (Common Mullein. Flannel-leaf.)

Introduced. Very common. July—1. (B)

1627. *V. Blattaria*, L. (Moth Mullein.)

Introduced. Rare. Near Cummings Bridge (*R. B. Whyte*), near the St. Louis Dam. Beechwood. There are two forms of this plant—one with yellow flowers, probably identical with the English plant, and a form with larger white flowers tinged with purple. It is probable that this last is an American variety.

LINARIA, Juss. Toad-flax.

1629. *L. vulgaris*, Mill. (Butter and Eggs.)

Introduced. Common. July—1. (B) The flowers vary much in depth of colour, from almost white to orange.

———— var. *Peloria*. This is a rare monstrous state with a regular 5-cleft border to the corolla, 5 spurs and 5 stamens. Plants collected in Metcalfe street produced racemes with every flower of this nature for several years.

CHELONE, L. Turtle-head.

1637. C. GLABRA, L.

In bogs and wet meadows. Common. July—1. (B)

PENTSTEMON, Mitchell. Beard Tongue.

1647. P. PUBESCENS, Solander.

Rocky banks. Rare. Hull. Little Chaudiere. Aylmer. July—1. (B)

MIMULUS, L. Monkey-flower.

1654. *M. ringens*, L.

In ditches and low ground. July—1. (B)

GRATIOLA, L. Hedge Hyssop.

1660. G. VIRGINIANA, L.

Low ground. July—2. (B) A low clammy pubescent plant. Flowers small, whitish, with the tubes yellow.

1661. G. AUREA, Muhl.

Alluvial flats. Rather rare. Malloch's Bay. Billings Bridge. New Edinburgh. A small slender plant growing amongst grasses, etc., with large golden-yellow flowers.

ILYSANTHES, Raf. False Pimpernel.

1662. I. GRATIOLOIDES, Benth. (False Pimpernel.)

On mud by the sides of rivers. July--2. (B) Small smooth annuals, very much branched and growing over the mud. The small purplish flowers produced all the summer.

VERONICA, L. Speedwell.

1667. V. ANAGALLIS, L. (Water Speedwell.)

In water, in ditches and streams. Leaves sessile. Ju.—2.

1668. V. AGRESTIS, Schwein. (American Brooklime.)

Brooks and ditches. July—1. Leaves thick, petioled. Pods swollen.

1669. V. SCUTELLATA, L. (Marsh Speedwell.)

Swamps and marshes. June—2. (B) Stems slender and weak. Leaves linear. Flowers in very slender zig-zag racemes. Pods flat, broader than long.

1671. V. OFFICINALIS, L. (Common Speedwell.)

Sandy woods. Rather rare. Beechwood. Hull. Chelsea. Aylmer. July—1. A pubescent prostrate plant with erect many-flowered racemes of pale, lavender flowers. Pod obovate-triangular, broadly notched.

1675. V. SERPYLLIFOLIA, L. (Thyme-leaved Speedwell.)

Open grassy places. May--3. (B) A prostrate, almost glabrous plant, the branchlets terminating in loose elongated racemes. Pod swollen broader than long.

1676. V. PEREGRINA, L. (Neckweed. Purslane Speedwell.)

Low ground where the water has lain in the spring. Ju.—1. (B) An erect, branched, almost smooth, weedy looking plant with minute flowers.

1677. *V. arvensis,* L. (Corn Speedwell.)

Rocky woods and fields. Ju.—2. Very pubescent, generally erect. Lower leaves petioled, crenate. The form found here has quite a different aspect from the English, which is a diffusely spreading plant with larger flowers and greener leaves.

1678. *V. agrestis,* L. (Field Speedwell.)

Introduced. Occasionally introduced with English grass-seed, but usually dying out after four or five years. Parliament Hill. Major's Hill Park. A pretty prostrate plant with bright blue and white flowers.

GERARDIA, L.

1684. G. PURPUREA, L. var. PAUPERCULA, Gray.

Marshes and on floating logs. Rideau Canal. Along the Ottawa. July—2. A slender branched plant with linear leaves and large funnel-shaped purplish-pink flowers.

PEDICULARIS, L. Lousewort.

1708. P. CANADENSIS, L. (Wood Betony.)

Dry woodlands and sandy fields. May—3. (B) A coarse but attractive plant with pinnately-parted leaves and dense spikes of yellow flowers tinged with rich brown.

MELAMPYRUM, L. Cow-wheat.

1719. M. AMERICANUM, Mx.

Sandy and rocky woods. Lake Windeago (*Dr. H. B. Small*). Rockcliffe. King's Mountain. July—1. Slender branching annuals with opposite leaves, the lower entire, the upper larger and fringed at the base. Flowers yellow, solitary in the axils of the upper leaves.

1878. P. LAPATHIFOLIUM, L. (Dock leaved Persicaria.)

P. nodosum, Pers. Macoun, Cat. III, 409.

Low ground. Aug.—1. Sheaths and bracts not ciliate. Spikes short, erect or nearly so. Peduncles with scattered sessile glands.

1879. ———— var. INCARNATUM, Watson.

P. incarnatum, Ell. Macoun, Cat. III, 409.

Low, rich ground. Not uncommon. Aug.—1. A tall, coarse plant sometimes four feet high, with long leaves and nodding, slender, spikes of pale pink flowers.

1880. P. PENNSYLVANICUM, L.

Low, rich ground. Common. Aug.—1. (B) A tall handsome species with conspicuous flowers. Easily recognisable by the stalked glands on the peduncles.

1882. P. AMPHIBIUM, L. (Water Persicaria.)

In shallow water. Common. Aug.—1. (B) Flower spike erect, terminal, borne above the water from the centre of two or three floating leaves.

1884. P. HARTWRIGHTII, Gr.

P. amphibium, L. var *terrestre*, Auct.

In ditches and at the sides of streams and ponds. Not uncommon. Aug.—1. This species has been, until lately, confounded with *P. amphibium* and *P. Muhlenbergii*, Watson. It differs from the former in its habit of growth and the nature of the inflores cence. In this species and *P. Muhlenbergii* the flowers are borne in a slender elongated spike. *P. Hartwrightii* has foliaceous and ciliate sheaths. These characters are lacking in *P. Muhlenbergii*, which, however, is rough, with appressed hairs all over.

1885. *P. Persicaria*, L. (Lady's Thumb.)

In cultivated and waste ground. Common. July—2. (B) Leaves usually blotched, sheaths fringed, peduncles without glands, spikes short and thick.

1886. *P. Hydropiper*, L. (Common Smartweed.)

Low ground. Annual. Aug.—2. (B) Whole plant smooth. Flowers greenish, tipped with pink, spikes nodding.

1887. P. ACRE, H B K. (Water Smartweed.)

Low ground. Rare. Billings Bridge. Aug.—1. Perennial.

Spike slender, erect, terminal. Flowers whitish. Sheaths covered with rusty hairs. The sepals of this and the last species are dotted with conspicuous glands.

1888. P. HYDROPIPEROIDES, Mx. (Mild Water-Pepper.)

In water and wet places along streams. Billings Bridge. Casselman. Hull. Aug.—1. Perennial. Stem smooth, weak, branching. Sheaths hairy. Flowers white in erect spikes. Sepals not dotted.

1890. *P. orientale*, L. (Prince's Feather.)

A garden escape. A tall, handsome annual with dense cylindrical spikes of large rose-coloured flowers. Billings Bridge. Aug.—2.

1895. P. ARIFOLIUM, L. (Halberd-leaved Tear-thumb.)

Swamps. Lake Flora. Mer Bleue. July—2. (B) Leaves large, long-petioled. Peduncles glandular, bristly.

1896. P. SAGITTATUM, L. (Arrow-leaved Tear-thumb.)

Low ground and along streams. Much commoner than the last. July—2. (B) Leaves short-petioled. Peduncles smooth.

Both of these last-named plants are annuals, with weak stems, beset on the angles with sharp, reflexed prickles, by means of which they support themselves amongst the low herbage where they grow.

1897. *P. Convolvulus*, L. (Black Bind-weed. Wild Buckwheat.)

An introduced and troublesome weed throughout the Dominion. June—4. Seeds black, dull.

1898. P. CILINODE, Mx. (Hairy-jointed Bind-weed.)

Sandy and clayey banks. Not uncommon. Aug.—1. (B) A rather attactive plant, with deeply-veined leaves. Stems red, climbing. Flowers white, in panicled racemes. Seeds smooth and shining.

1899. P. DUMETORUM, L. var. SCANDENS, Gray. (Climbing False Buckwheat.)

Climbing over bushes. Township of March *(A. H. Moore)*. Chats Rapids. Rare. Aug.—1. Seed smooth and shining.

FAGOPYRUM, Tourn. Buckwheat.

1900. *F. Tartaricum*, L. (Rough Buckwheat.)

An accidental introduction. Billings Bridge. Stewarton. July

—3. This plant differs from *F. esculentum* in having smaller greenish flowers and a wrinkled seed.

1901. *F. esculentum*, Mœnch. (Common Buckwheat.)

Introduced. Common. Aug.—1.

RUMEX, L. Dock.

1904. R. OCCIDENTALIS, Watson.

Swamps. St. Louis Dam. Lake Flora. Hull. July—1. A tall species. Valves of the seed rounded, heart-shaped, without exterior grain-like tubercles.

1906. R. BRITANNICA, L. (Great Water-Dock.)

R. orbiculatus, Gray.

Swamps and beside streams. Malloch's Bay. Hull. Mer Bleue. Aug.—2. Tall and stout, with a contracted panicle. Seed-valves round-ovate, all grain-bearing.

1907. R. SALICIFOLIUS, Weinmann. (White Dock.)

Introduced here from the west. Waste lot on Albert street. Several plants. July—2. This dwarf species is easily recognised by its pale, almost glaucous, narrow leaves and copious yellowish fruit. Seed-valves deltoid-ovate, with one, two, or sometimes all three, bearing a large grain.

1908. R. VERTICILLATUS, L. (Swamp Dock.)

River sides and ditches. Rather uncommon. Billings Bridge. Skead's Mill. Hull. Templeton. June.—3. (B) The lower whorls of flowers distant. Fruit-bearing pedicels elongated, three to four times longer than the calyx, abruptly reflexed. Seed valves each bearing a large grain.

1909. *R. crispus*, L. (Curled Dock.)

Introduced. Common by roadsides and in cultivated ground. June—3. (B) Easily recognised by the waved margin of the leaves. Seed-valves round-heart-shaped, mostly grain-bearing. Much used as a pot herb.

1910. *R. obtusifolius*, L. (Bitter Dock. Dairymaids' Dock.)

Introduced. Much rarer than the last. Rifle Range. Billings Bridge. Gatineau Point. July—2. Seed-valves ovate-halberd-shaped, with three to five large lateral teeth towards the base. This is the best dock for removing the pain of nettle stings.

1912. R. **maritimus**, L. (Golden Dock.)

River bank. Rare. Green's Creek *(A. H. Moore)*. New Edinburgh *(H. M. Ami)*. Hull *(Prof. Macoun)*. Aug.—2. A low plant, with crowded, leafy, compact spikes of yellow fruit. Seed-valves spear-shaped, with two long teeth on each side and a large grain on the back.

1913. *R. Acetosa*, L. (Common Sorrel.)

Occasionally introduced with grass seed; but not persistent. Billings Bridge. Hintonburgh. July—2. Diœcious. Seed-valves grain-bearing, enlarging as the fruit ripens.

1915. R. Acetosella, L. (Sheep Sorrel.)

Abundant in sandy soil and exhausted fields. July—1. Diœcious. Seed-valves ovate, scarcely enlarging in fruit, not grain-bearing.

ARISTOLOCHIACEÆ.

ASARUM, L. Asarabacca.

1916. A. Canadense, L. (Wild Ginger.)

Rich woods. Common. May—4. (B) A charming plant, with its rich purplish brown, three-cleft flower, borne low on the ground beneath the leaves, in the axil of the two delicate green, pubescent, kidney-shaped leaves. The fleshy root is aromatic, when broken smelling like ginger.

PIPERACEÆ.—Pepper Family.

SAURURUS, L. Lizard's Tail.

1918. S. cernuus, L.

In shallow water. In great abundance along the Nation River at Casselman. July—3. This is the only station so far recorded in this part of Canada.

THYMELEACEÆ. Mezereon Family.

DAPHNE, L.

1921. *D. Mezereum*, L. (Mezereon.)

Rocky woods. Near Hemlock Lake, Beechwood. (Mrs. Chamberlin.) Ap.—4. Introduced, but well established. The beautiful pink or white fragrant flowers opening before the leaves. Followed by scarlet berries.

OROBANCHACEÆ.—Broom-rape Family.

EPIPHEGUS, Nutt. Beech-drops.

1728. E. VIRGINIANA, Bart. (Cancer-root.)

Under beech trees and parasitic upon their roots. Woods near St. Louis Dam. Beechwood. Chelsea. Oct.—2. (B) A curious branched, leafless, purplish herb about nine inches in height. Flowers many, of two kinds, the upper conspicuous, with a long tubular striped corolla, but sterile; the lower fertile, with a very short corolla.

LENTIBULARIACEÆ.—Bladder-wort Family.

UTRICULARIA, L. Bladder-wort.

1731. U. VULGARIS, L. var. AMERICANA, Gray.

Floating in ditches and slow streams. Common. July—2. (B) Perennial. In autumn round, solid, winter-buds about half an inch in diameter form at the tips of the branchlets. These sink to the bottom of the water and the rest of the plant dies.

1734. U. INTERMEDIA, Hague.

Floating in shallow water and creeping over soft mud, beneath carices and other marsh vegetation. Rideau canal. Billings Bridge. Gatineau Point. Hull. July—2. A much slenderer plant than 1731, with all the bladders on separate leafless branches. Flowers large and few, very rarely produced.

1736. U. CORNUTA, Mx.

Sphagnous swamps. At the gas-spring in the Mer Bleue, Eastman's Springs. In a small swamp at Black Lake, Kingsmere. July—2. A remarkable plant, consisting of a slender stem with a few large yellow flowers at the summit, no leaves, and very few rootlets.

VERBENACEÆ.—Verbena Family.

PHRYMA, L. Lop-seed.

1744. P. LEPTOSTACHYA, L.

Low open woods. Not uncommon. July—1. (B).

VERBENA, L. Verbena.

1745. V. URTICÆFOLIA, L. (White-flowered Vervain).

Roadsides and rocky pastures. Rare in this locality. Hintonburgh. Beechwood. July—1.

1746. V. HASTATA, L. (Purple Vervain).

Roadsides and meadows. July—2. (B).

LABIATÆ.—Mint Family.

TEUCRIUM, L. Germander.

1750. T. CANADENSE, L.

Sandy river banks. Along the Ottawa and Rideau Rivers. July—2.

MENTHA, L. Mint.

1753. M. *viridis*, L. (Spear-mint).

A garden escape. Flowers in a slender terminal spike. Aug.—1.

1754. M. *piperita*, L. (Peppermint).

Introduced, but very common in low ground and along streams. Flowers in an interrupted terminal spike. Aug.—1.

1758. M. CANADENSIS, L. (False Pennyroyal.)

In low ground. The whole plant canescently hairy with a strong odour of Pennyroyal. July—2. (B.)

————var. GLABRATA, Benth.

With the last; but stouter and much smoother with dark coloured foliage and a different scent. July—1.

LYCOPUS, L. Water Horehound.

1759, L. VIRGINICUS, L. (Bugle weed).

Low wet woods. July—2 (B) Calyx-teeth 4, ovate. **Leaves** almost sessile, toothed, entire towards the base. Angles **of the** stem rounded.

1761. L. SINUATUS, Ell,

L. Europæus, L. var. *sinuatus*, Gray.

Low woods, July—2. Calyx-teeth 5, tapering to a very **sharp** point. Angles of the stem acute. Leaves very variable, **sinuate**-toothed to pinnatifid.

HYSSOPUS, L. Hyssop.

1762. *H. officinalis*, L. (Garden Hyssop.)

Introduced—Richmond Road. Dalhousie Square. The white-flowered form abundant. The purple-flowered scarce. A perennial herb with simple branches, linear, entire leaves, and the flowers which are in clusters forming crowded spikes. July--1.

SATUREIA, L. Savory.

1767. *S. hortensis*, L. (Summer Savory.)

Introduced. Frequently found on waste heaps and road sides.

CALAMINTHA, Mœnch. Calamint.

1770. C. CLINOPODIUM, Benth. (Basil.)

Rocky woods and fields. Common. June. (B)

HEDEOMA, Pers. (Pennyroyal.)

1772. H. PULEGIOIDES.

Rich wood Billings Bridge. Very rare. A slender erect herb, strongly scented. July—1.

LOPHANTHUS, Benth. Giant Hyssop.

1779 L. NEPETOIDES, Benth.

River bank at Casselman. Aug.—2. A tall, smooth perennial, with a sharply 4-angled stem bearing petioled coarsely crenate-toothed leaves and long terminal spikes of greenish yellow flowers.

NEPETA, L. Cat-mint.

1782. *N. Cataria*, L. (Catnip.)

Introduced, but common everywhere. July--2. (B)

1783. *N. Glechoma*, Benth. (Ground Ivy.)

A garden escape. Occasionally found by waysides. Stewarton. Hintonburgh. Aylmer. Aug.--1.

DRACOCEPHALUM, L. Dragon-head.

1784. D. PARVIFLORUM, Nutt.

Rocky woods; particularly after fires have run through them. June—1.

SCUTELLARIA, L. Skull-cap.

1785. S. LATERIFLORA, L. (Mad-dog Skull-cap.)

Low ground. July—1. (B.) Flowers small in axillary and terminal one-sided racemes.

1787. S. PARVULA, Mx.

Dry banks and in sand. June—2. Not so common as our other two species. A low, branching, pubescent plant, spreading by means of stolons which bear several elongated and connected tuber-like swellings.

1789. S. GALERICULATA, L. (COMMON SKULL-CAP.)

On floating logs and banks of streams. July—1. (B.) A tall, graceful plant with showy flowers.

BRUNELLA, Touru. Self-heal.

1790. B. VULGARIS, L. (Common Heal-all.)

Prunella vulgaris, L.

Introduced (?) Damp woods and fields. June—2. (B)

LEONURUS, L.

1794. L. *Cardiaca*, L. (Common Motherwort.)

Pastures and clearings. July—1. (B)

LAMIUM.

1795. *L. amplexicaule*, L. (Hen-bit Dead-nettle.)

Introduced. Rare and not persistent. Billings Bridge. Stewarton. Bell's Corners. July—3.

GALEOPSIS, L. Hemp-nettle.

1798. G. *Tetrahit*, L. (Common Hemp-nettle.)

Introduced. Common in waste places and cultivated fields. July—3. (B) Easily known by the bristly stems which are swollen beneath the joints. Flowers often yellowish or white.

STACHYS, L. Woundwort.

1800. S. PALUSTRIS, L.

Wet ground along streams. July—1. (B.) A variable plant in which 1801 should probably be included as a variety. Plants which answer to var. *cordata*, Gray, and var. *glabrata*, Gray, are found both at Billings Bridge and Kettle Island.

1801. S. ASPERA, Mx.

S. palustris, L., var. aspera, Gray.

With the last. A slenderer plant with narrower leaves, the angles of the stem beset with stiff reflexed bristles.

PLANTAGINACEÆ.—Plantain Family.

PLANTAGO, L. Plantain.

1804. *P. major*, L. (Common Plantain.)

Introduced. July—1. (B.) The var. *bracteata*, Macoun, is an accidental form which is sometimes found in low ground, but which is not permanent under cultivation.

1805. P. RUGELLII, Decaisne. (Pale Plantain.)

Low ground. Common. June—4. Easily distinguishable from *P. major* by its slenderer spikes, and much more erect pale yellowish-green leaves. Petioles purplish at the base.

1810. *P. lanceolata*, L. (Rib-wort Plantain.)

Introduced with seed of lawn grasses. Not very persistent. August—2.

1814. *P. media*, L. (Scented Plantain.)

Sparingly introduced; but thoroughly naturalised and very persistent on Parliament Hill and Major's Hill. Leaves ovate, canescently downy, flat on the ground, petioles very short. Flowers silvery and showy with pale purple filaments. Sweetly scented.

APETALOUS EXOGENS.

AMARANTACEÆ.—Amaranth Family.

AMARANTUS, L. Amaranth.

1825. *A. retroflexus*, L. (Pig weed. Red root.)

Introduced but thoroughly naturalised in all well-manured soils throughout Ontario. July—2. (B)

1826. *A. albus*, L.

Naturalised. July—2. A low spreading plant with whitish stems and the greenish flowers crowded in the axils of the long-petioled obovate leaves.

ACNIDA, L. Water-hemp.

1828. A. RUSCOCARPA, Gray.

Montelia tamariscina, Gray.

In low marshy ground along rivers. Brigham's Creek, Hull. Casselman. Aug.—1. A diœcious annual plant with much the appearance of an *Amarantus*.

1829. A. TUBERCULATA, Moq.

M. tamariscina, var. *concatenata*, Gray.

A. cannabina, L.

Sandy river banks and flooded fields. Britannia. Hull. Gatineau Point. Aug.—2. Flowers of the lower clusters, in the fertile plant, forming thick distant heads in the axils of the leaves.

CHENOPODIACEÆ.—Goosefoot Family.

CHENOPODIUM. Goosefoot.

1831. *C. album*, L. (Lamb's quarters. Pig weed.)

Introduced. Abundant everywhere. June—2. (B.) A most variable plant in all its stages. In early spring the young leaves of some plants, particularly beneath, are a rich pinkish purple. When growing in poor sandy soil, the whole plant is silvery white. Late in the season, most of the plants are greener with very little mealiness and fewer flowers. The leaves are no less variable in shape than they are in colour. Until all these forms have been grown separately throughout the season, they must all be classed under the type *C. album*, L.

1833. C. *hybridum*, L. (Maple-leaved Goosefoot.)
Introduced. Cultivated ground. July—2. (B.) Plants tall and widely branching. Leaves thin and glabrous.

1834. *C. urbicum*, L. (Upright Goosefoot.)
Waste places in the city. Not common. Aug.—2. An erect, fleshy-leaved plant, generally tinged with red. Flowers chiefly in erect axillary clusters or in a short terminal leafy panicle. Seeds large and horizontally placed.

1835. *C. botrys*, L. (Jerusalem Oak. Feather Geranium.)
Introduced. Scarce; most abundant along the Rideau below Cummings Bridge. July—2. An erect, ornamental, bright-green, glandular-pubescent, branching plant. Flowers in feathery terminal cymose racemes. Whole plant pleasantly aromatic.

1836. *C. ambrosioides*, L. (Mexican Tea.)
Sparingly introduced. Stewarton. July—2. A tall, coarse, branching herb with tapering repand-toothed leaves and the flowers in dense leafy spikes. Strongly and unpleasantly scented.

1837. *C. glaucum*, L. (Oak-leaved Goosefoot.)
Introduced. Low ground. Not common. Aug.—2. A low spreading or erect plant with glaucous-mealy, pinnatifid-toothed leaves. Stems pinkish.

1838. *C. Bonus-Henricus*, L. (Good King-Henry. Perennial Goosefoot.)
Introduced. Rare. Aylmer, Mer Bleue. July—1.

1839. C. CAPITATUM, Benth & Hook. (Strawberry Blite.)
Blitum capitatum, L.
Damp woods and clearings, particularly after fires. June—2. (B.)

ATRIPLEX, L. Orache.

1841. *A. patula*, L.

"Specimens which we take for this species, are almost smooth and bright-green, with the cusps of the leaves erect. In every case introduced. This form is found around all towns and villages in Ontario." (Macoun's Cat., Pt. III, p. 401.)

———— var. HASTATA, Gray.

Low ground. Uncommon. River side below Parliament Hill. Gatineau Point. New Edinburgh. Aug.—2. Leaves thick, the lower ones triangular-halberd-shaped.

KOCHIA.

K. scoparia, L.

Introduced. Two patches of this annual plant have been noticed for some years; one by the roadside near the old Crown Timber Office, the other by the roadside at Billings Bridge. It is a curious, erect, branching plant with somewhat the appearance of a *Suœda*. Leaves lanceolate, thin and pubescent. Flowers bearing a tuft of white down at the base.

PHYTOLACCACEÆ.—Poke-weed Family.

PHYTOLACCA, L. Poke-weed.

1860. *P. decandra*, L. ("Pigeon Berry." Garget.)

Introduced, here. Waste places, Stewarton. Aug.—2. A tall, handsome perennial with deep green foliage and purplish red stems. The flowers small and white, in slender racemes, followed by dark purple, depressed, 5—12-celled berries.

POLYGONACEÆ.—Buckwheat Family.

POLYGONUM, L. Knot-weed.

1869. P. AVICULARE, L. (Knot-grass Door-weed.)

Sandy soil and waste places. June—4. (B.) A very variable plant. We doubtless have both native and introduced forms of this plant. Dr. Gray notices in his Manual that the American form has "stamens, chiefly 5 in the American, 8 in the European plant."

AMPHICARPÆA, Ell. Hog Pea-nut.

563. A. MONOICA, Ell.

River banks and islands. Aug.—1. (B.) A graceful creeper, with pretty trifoliate foliage, slender twining stems and delicate purplish flowers; bearing, as well as the thin scymetar-shaped pods which follow the upper flowers, large fleshy reniform subterranean pods which are generally one-seeded.

ROSACEÆ.—Rose Family.

PRUNUS, Tourn. Plum, Cherry.

568. P. AMERICANA, Marshall. (Wild Red Plum.)

Thickets. May—3. (B)

The fruit of this species varies very much upon different trees, both in size and colour, and also in quality. Many varieties are cultivated, and form a valuable fruit for domestic purposes.

——— var. MOLLIS, T. & G. Fl. I. 407.

In Prof. Macoun's Catalogue this variety is recorded as follows: "Chaudière Falls, Ottawa (?) (Pursh.) This is the black "fruited variety of our wild plum, and is to be looked for "throughout Ontario. It is probable we have two species in "our territory." I have never succeeded in finding it here.

570. P. PUMILA, L. (Dwarf Cherry.)

Growing in crevices and trailing over rocks. Chaudière Islands and Rockcliffe. Rare. Ju.—1. This is possibly the plant recorded as *P. maritima* from the "borders of the Ottawa" by Pursh.

571. P. PENNSYLVANICA, L. (Bird Cherry, Red Cherry.)

Sandy and rocky woods. A graceful tree, sometimes 30 feet high. Well suited for lawns. May—2. (B)

573. P. VIRGINIANA, L. (Choke Cherry.)

River banks and thickets. An ornamental shrub bearing a profusion of racemes of white flowers. Fruit, dark purplish red; very astringent. May—3. (B)

575. P. serotina, Ehrh. (Black Cherry.)
Woods. An uncommon tree in this locality. King's Mountain, Chelsea. Billings Bridge. Beechwood. Fruit in long racemes, black, slightly astringent. May—4. (B)

SPIRÆA, L. Meadow Sweet.

577. S. salicifolia, L. (Willow-leaved Meadow Sweet.)
Low ground. July—2. (B.)

578. S. tomentosa, L. (Hardhack, Pink Spiræa.)
Low ground. Aug.—1. (B.)

NEILLIA, Don.

584. N. opulifolia, Benth & Hook. (Nine-bark.)
Spiræa opulifolia, L.
Rocky river banks. An ornamental shrub with bright foliage and bearing a profusion of white flowers, which are followed by corymbs of pinkish, membranaceous, inflated pods. Ju.—3. (B)

RUBUS, Tourn. Bramble. Raspberry.

586. R. odoratus, L. (Purple Flowering Raspberry, "Mulberry.")
Thickets and rocky fields. Ju.—2. (B.)

590. R. Dalibarda, L. (Barren Raspberry.)
Dalibarda repens, L.
In a low swampy wood at Eastman's Springs (*J. F.*). Damp wood at Casselman (*Prof. Macoun*). Very local, only detected in the above localities. July—2.

592. R. triflorus, Rich. (Swamp-berry.)
Swamps and peat bogs. May—3 (B.)

594. R. strigosus, Mx. (Red Raspberry.)
Rocky woods and borders of fields. Ju.—2. (B.)

595. R. occidentalis, L. (Black Raspberry.)
Rocky woods. A useful fruit, ripening between the last and the next. A variety with yellow fruit has twice been found in this district. Ju.—3. (B.)

600. R. **VILLOSUS**, Ait. (Blackberry, Thimbleberry.)
Rocky and sandy woods. What I take to be the type of this species is found at Kingsmere. The whole plant is more glandular than the ordinary form, and although the lower bracts are generally leafy the description answers as to inflorescence, &c.

——— var. **FRONDOSUS**, Tor.
Woods and thickets. The common form. Ju.—2. (B.)

——— var. **HUMIFUSUS**, T. & G.
Low ground and shady river banks. This is a very distinct variety, which seems worthy of a specific name. Stems low (1 to 2 feet) and trailing, with weak prickles. Flowers few in number, fine and large. Patterson's Creek. Hull. Aylmer. Ju.—3.

601. R. **CANADENSIS**, L. (Low Blackberry.)
Rocky woods and sandy fields. Montreal Road. (*R. B. Whyte*) King's Mountain and Aylmer (*J. F.*) Ju.—2.

602. R. **HISPIDUS**, L. (Swamp Blackberry.)
Borders of peat-bogs. Mer Bleue. Race-course swamp, Bank Street Road. Aylmer. Ju.—2.

GEUM, L. Avens.

607. G. **ALBUM**, Gmelin. (White Avens.)
Low woods. July—1. (B.)

609. G. **MACROPHYLLUM**, Willd. (Large-leaved Avens.)
Rocky woods. Little Chaudiere. Hull. Chelsea. July—1.

610. G. **STRICTUM**, Ait. (Yellow Avens.)
Woods and thickets. July—1. (B.)

612. G. **RIVALE**, L. (Nodding or Purple Avens.)
Swamps. Lake Flora. Buckingham. Dow's Swamp. Stewarton. Ju.—3.

WALDSTEINIA, Willd.

616. W. **FRAGARIOIDES**, Tratt. (Barren Strawberry.)
Woods and thickets. May—3. (B.)

FRAGARIA, Tourn. Strawberry.

620. F. VIRGINIANA, Duchesne. (Round-fruited Strawberry.)
Woods and fields. May—3. (B.)

621. F. VESCA, L. (Wood Strawberry.)
Woods and rocky fields. Fruit pointed and seldom more than 2 ripe at once upon a scape, while *F. Virginiana* frequently has 5 or 6. The whole plant of *F. vesca* is villous downy. Ma.—1 (B.)

POTENTILLA, L. Five Fingers.

623. P. ARGUTA, Pursh.
Rocky banks. A tall coarse plant with cream-coloured flowers. Rare. Britannia (*R. B. Whyte.*). King's Mountain (*J.F.*) Ju.—2.

625. P. NORVEGICA, L.
Fields. Ju.—2. (B.)

637. *P. argentea*, L, (Silvery Potentilla.)
Introduced. Fields and waysides. Very much commoner than a few years ago. Stewarton abundant. New Edinburgh. Theodore street. July—1.

645. P. PALUSTRIS, Scop. (Marsh Five-finger.)
Comarum palustre, L.
Peat-bogs and Marshes. July—1.

649. P. ANSERINA, L. (Silver Weed.)
Sandy margins of rivers. July—1. (B.)

650. P. CANADENSIS, L.
Pine woods at Aylmer. Rare in this district. Some of the specimens in open dry spots taking the form of the var. *simplex* T. & G. Ju.—1.

AGRIMONIA, Tourn. Agrimony.

654. A. EUPATORIA, L. (Common Agrimony.)
Borders of woods. July—1. (B)

ROSA, Tourn. Rose.

660. R. Carolina, L, (Swamp Rose.)

Borders of swamps. Rare. Hull. Aylmer (*J.F.*) Meech's Lake (*H. M. Ami*). July—2.

662. R. blanda, Ait. (Early Wild Rose.)

Rocky islands and fields. Ju.—1. (B.)

2135. R. Sayii, Schwein. (Prickly Wild Rose.)

R. blanda, Ait. var. *setigera*, Crépin.

A pretty species somewhat like *R. blanda;* but with very prickly stems and glaucous pinkish-tinged round, oval, or almost pear shaped fruit. Hull. Kingsmere. Ju.—1.

670. *R. micrantha*, Smith. (Sweet Brier.)

Introduced. A few bushes of this rose are to be found growing wild as at Hull and near the St. Louis Dam; but they do not increase here as they do in Western Ontario. Ju.—1.

PIRUS, L. Pear.

672. *P. malus*, L. (Cultivated Apple.)

Introduced. Trees which have grown from seed of cultivated apples are occasionally found in thickets and by waysides. The native crab, *P. coronaria*, L. has never yet been found in this district.

673. P. arbutifolia, L. (Choke-berry.)

P. arbutifolia. L. var. *erythrocarpa*, G.

Peat-bogs. Pedicels and leaves beneath pubescent. Fruit purple. Ju.—1.

———— var. melanocarpa, Hook.

Peat-bogs. With the above, but much more abundant. Leaves and pedicels almost smooth, and the somewhat smaller berries much blacker. Ju.—1.

674. P. Americana, DC. (American Mountain Ash.)

Rocky woods. King's Mountain and other places near Chelsea. Ju.—2. The buds of this species are covered with a resinous gum.

———— var. microcarpa, T. & G.

Rocky woods. Fruit much smaller. Trees of this variety brought from King's Mountain are now growing in the two gardens on the N.E. and N.W. corners of Metcalfe and Cooper streets.

675. P. SAMBUCIFOLIA, Cham & Schlecht.

Peat-bog. A shrub closely resembling *P, Americana*, but with downy buds, is growing in the Lake Flora bog, Hull. This species and the preceding appear to run so close together as to suggest that they are, as Michaux thought, only varieties of one species. Ju,—2.

——. *P Aucuparia*, Meyer. (Rowan Tree.)

Introduced. Extensively cultivated as an ornamental tree, and naturalized from seed in many of our woods.

CRATÆGUS, L. Hawthorn.

678. C. COCCINEA, L. Scarlet-fruited Thorn.

Thickets and fields. May—4.

Leaves thin, pedicels glabrous or nearly so.

———— var. MACRANTHA, Lodd.

C. tomentosa, L. of Gray's Manual and other authors.

Thickets. May—4. (B.)

Leaves thicker, pedicels calyx, and leaves when young villous-pubescent.

Prof. Macoum tells me that what has up to this time been taken as *C. tomentosa*, from this locality is not that species, but merely a pubescent variety of *C. coccinea*, as is also the var. *pyrifolia* of his catalogue.

The working up of the Thorns of this locality is a simple matter. We have only detected the above mentioned forms, and these seem to vary very little. They require more study, however, and careful search should be made for the true *C. tomentosa*. which is described in "Garden and Forest," 1888, p. 249, as flowering some weeks later than the forms of *C. coccinea*, with pale gray branches almost destitute of thorns, leaves thicker and more pubescent, without glands, gradually contracted into a stout margined petiole, densely pubescent on the under side as are the calyx and stems of the inflorescence, corymbs broader and looser, fruit smoother. We have none of the yellow-fruited varieties of Western Ontario at Ottawa.

AMELANCHIER, Medic. June-berry. Service-berry.

685. A. CANADENSIS, T. & G. (Shad-bush.)

A. Canadensis, T. & G. var. *Botryapium*, Gray.

Thickets and woods, May—3. (B.)

This is a most variable species, and it is sometimes difficult to refer specimens to the characterised varieties. Those referred to the type have pointed, sharply serrate, glabrous leaves (varying, however, to villous-pubescent when young), flowers large, in pendulous racemes. Here, too, must come a beautiful variety found upon King's Mountain, recorded in the 1887 list as var. *alnifolia*. The leaves are large, oblong, coarsely-serrate and glabrous. The flowers larger than those of the type. In fact it resembles *A. alnifolia* of the West very closely, and only differs in the leaves, which in the Ottawa plant are thin and toothed much lower down to the base. I have never seen the fruit.

——————— var. (?) OBLONGIFOLIA, T. & G.

Rocky banks. Parliament Hill. Little Chaudiere. Hull. May—4.

A small shrub. If a variety of *A. Canadensis*, a very distinct one with erect racemes of small creamy-white flowers and the leaves beneath, & branchlets thickly covered with yellowish-white down.

SAXIFRAGACEÆ.—Saxifrage Family.

SAXIFRAGA, L. Saxifrage.

699. S. VIRGINENSIS, Mx. (Spring Saxifrage.)

Rocks. Rockcliffe. Chelsea Hills. May—3.

TIARELLA, L. False Mitre-wort.

720. T. CORDIFOLIA, L. ("Wood Mignonette.")

Rich woods. A charming spring flower. May—2. (B.)

MITELLA, Tourn. Mitre-wort.

723. M. DIPHYLLA, L.

Rich woods. May—2. (B.)

724. M. NUDA, L.

Cold swampy woods. May—2. (B.)

This is one of the gems of our woods. The inconspicuous green flowers are of exquisite beauty when examined, and have a most powerful odour for such small flowers.

CHRYSOSPLENIUM, Tf't. Golden Saxifrage.

735. C. AMERICANUM, Schwein.

In brooks and swampy woods. May—3. (B.)

RIBES, L. Gooseberry. Currant.

747. R. OXYACANTHOIDES, L. (Smooth Gooseberry.)

R. hirtellum, Mx.

Swamps. May—3.

The fruit, although small, is very pleasant.

749. R. CYNOSBATI, L. (Prickly Gooseberry.)

Rocky banks. May—3. (B.)

750. R. LACUSTRE, Poir: (Bristly Gooseberry.)

Wet woods. May—4. (B.)

Young stems thickly beset with slender prickles. Fruit bristly and growing in a raceme, almost tasteless.

752. R. RUBRUM, L. (Red Currant.)

Cool woods. May—2.

Fruit sparsely produced, astringent.

753. R. PROSTRATUM, L'Her. (Fetid Currant, Skunk Currant.)

Swamps and cool woods. May—3.

Stems prostrate. Fruit red, bristly, and very unpleasant.

757. R. FLORIDUM, L'Her. (Wild Black Currant.)

River banks and thickets. May—3. (B.)

A useful shrub bearing a profusion of greenish yellow flowers followed by quantities of palatable ovoid fruit of the same character as the cultivated Black Currant.

CRASSULACEÆ.—Orpine Family.

PENTHORUM, Gronov. Ditch Stone-crop.

762. P. SEDOIDES, L.

Ditches. July—1. (B.)

SEDUM, Tourn. Stone Crop.

763. *S. acre*, L. (Mountain Moss. Stone Crop.)

Introduced. On limestone rocks. Richmond Road, New Edinburgh. Mount Sherwood, June—3,

768. *S. Telephium*, L. (Live for ever. Orpine.)
Introduced. On the rocks round Parliament Hill. Near St. Louis Dam. July—1.

DROSERACEÆ—Sundew Family.

DROSERA, L. Sundew.

771. D. ROTUNDIFOLIA, L. (Round-leaved Sundew.)
Peat bogs. June—4.

773. D. INTERMEDIA, Drev & Hayne, var. AMERICANA, DC.
D. longifolia, Mx.
Peat bogs, with the last. Mer Bleue. Dow's Swamp, &c. Ju.—4.

HAMAMELACEÆ—Witch Hazel Family.

HAMAMELIS, L. Witch Hazel.

775. H. VIRGINIANA, L.
H. Virginica, L.
Thickets. Very rare at Ottawa. The only locality being on the Chelsea Road about 2 miles from Hull, where there are a few bushes. An interesting shrub, flowering after the leaves have fallen. Oct.—3.

HALORAGEÆ—Water Milfoil Family.

MYRIOPHYLLUM, Vaill. (Water Milfoil.)

776. M. SPICATUM, L
In ponds and slow-running streams. July—1.

PROSERPINACA, L. (Mermaid Weed.)

780. P. PALUSTRIS, L.
In shallow water. "Banks of the Nation River at the crossing of the Ottawa & Prescott Railway," (*B. Billings.*) July—1. Not since found. To be looked for at Casselman and at the Mer Bleue.

HIPPURIS, L. Mare's Tail.

781. H. VULGARIS, L.
In mud on the banks of rivers. Rare. Malloch's Bay. Hull. New Edinburgh.

ONAGRACEÆ—Evening-Primrose Family.

LUDWIGIA, L.

784. L. PALUSTRIS, Ell. (Water Purslane.)

Isnardia palustris, L.

Ditches and borders of rivers. July.

EPILOBIUM, L. Willow Herb.

786. E. SPICATUM, L. (Fire Weed. Great Willow-herb.)

E. angustifolium, L.

Low ground in woods, especially after fires have run over them. July—1. (B)

792. E. COLORATUM, Muhl.

Low ground. July—1. (B)

794. E. PALUSTRE, L. var. LINEARE, L.

Swamps. July—1. (B)

796. E. MOLLE, Torrey.

Swamps. Lake Flora (*J. A. Guignard*). Upon a small island in the Rideau Canal near C. A. Railway station. Mer Bleue. (*J.F.*) Uncommon. Leaves wider and the rose-coloured flowers larger than those of 794. Whole plant villous-pubescent. July.

ŒNOTHERA, L. Evening Primrose.

800. Œ. BIENNIS, L. (Common Evening Primrose.)

Fields and waste places. July—1. (B)

An exceedingly variable species. What I have considered as the type has green stems and pods without tubercles or bristles and petals almost the length of the stamens. This almost answers to Gray's var. *parviflora*, but the flowers are too large.

———— var. MURICATA, Lindl.

This is the commonest form at Ottawa, with stems and pods rough with red bristle-bearing tubercles. Petals rather longer than the stamens.

———— var. GRANDIFLORA, Lindl.

A distinct variety with large showy flowers. Stems and pods without bristles. Malloch's Bay. Hull. Stewarton.

Œ. BIENNIS, L. var. OAKESIANA, Gr.

Leaves and stems apparently glabrous, but with a minute appressed pubescence. On the rocks above the Locks going up to Major's Hill Park.

803. Œ. PUMILA, L. (Dwarf Evening Primrose.)

River banks. July—1. (B) When growing in damp places almost glabrous. When on dry sandy banks the stems are more slender and the whole plant more pubescent, it is then *Œ. chrysantha*, Mx.

CIRCÆA. Enchanter's Nightshade.

817. C. ALPINA, L.

Low shady woods and swamps. July—1. (B)

818. C. LUTETIANA, L.

C. Lutetiana, var. *Canadensis*, *L.*

Woods. July—2. (B)

Linné considered our Canadian plant a distinct variety. It certainly seems to me to be different from the European form.

LYTHRACEÆ—Loosestrife Family.

LYTHRUM, L. Loosestrife.

822. L. SALICARIA, L. (Spiked Loosestrife.)

Introduced here. Railway bank. Found along the line of the Canada Atlantic Railway, a quarter of a mile from the Elgin street station (*W. Scott, B.A.*) Aug.—2.

NESÆA, Juss. Swamp Loosestrife.

823. N. VERTICILLATA, HBK.

Borders of ponds and rivers, Aug.—1.

CUCURBITACEÆ—Gourd Family.

SICYOS, L. Star Cucumber.

827. S. ANGULATUS, L.

Not indigenous in this locality. Frequently found on waste heaps, but always as a garden escape. Ju.—2.

ECHINOCYSTIS, T. & G.

828. E. LOBATA, T. & G. (Wild Cucumber.)

Introduced from the North-West, where it grows along streams. Extensively cultivated as a creeper for its rapid growth, as well as its showy flowers and fruit. Ju.—2.

UMBELLIFERÆ—Parsley Family.

HYDROCOTYLE, Tourn. Water Penny-wort.

834. H. AMERICANA, L.

Borders of swamps and damp places. July—1.

SANICULA, Tourn. Black Snake-root.

835. S. CANADENSIS, L. (Canada Sanicle.)

Rich woods. Rare. Billings Bridge. Hull. Ju.—2.

836. S. MARILANDICA, L.

Rich woods. Common. Ju.—1. (B)

Easily distinguished from the last by the long styles, which are much longer than the prickles of the fruit, and are recurved. The leaves are all 5-7-parted, whilst those of *S. Canadensis* are 3-5-parted (the upper only 3-).

CONIUM.

840. *C. maculatum*, L. (Poison Hemlock.)

Introduced. Uncommon. July—2.

APIUM, L. Parsley,

844. *A. Petroselinum*, L. Parsley.

Introduced. Occasionally spontaneous and living over the winter to produce seed; but of uncertain tenure.

CORIANDRUM, L. Coriander Seed.

—— *C. sativum*, L.

Introduced. Ju.—3.

CARUM, Koch. Carraway.

845. *C. Carui*, L.

Introduced, Waste heaps. Not uncommon. Ju.—3.

THASPIUM, Nutt. Meadow Parsnip.

849. T. AUREUM, Nutt.

Rocky river bank. Casselman. Aug.—2. (*Miss Isabel Grant*).

CICUTA, Koch. (Water Hemlock.)

851. C. MACULATA, L. (Spotted Cowbane.)

River sides and ditches. Billings Bridge. Hull. July—1. (B)

853. C. BULBIFERA, L.

River sides and swampy ground. Aug.—1.

SIUM, L. Water Parsnip.

854. S. CICUTÆFOLIUM, Gmelin.

S. lineare, Mx.

River sides. July—.2 (B)

CRYPTOTÆNIA, DC. (Honewort.)

855. C. CANADENSIS, DC.

Rich damp woods. Ju.—2. (B)

BUPLEURUM, L. Thorough Wax.

2151. *B. rotundifolium*, L.

Introduced. Oat-field at Billings Bridge, 3 or 4 plants. Ju.—2.

OSMORRHIZA, Raf. Sweet Cicely.

858. O. LONGISTYLIS, DC. (Smoother Sweet Cicely.)

Rich woods. Uncommon. Gatineau Point. Hull. Beechwood. Styles conspicuous. May—4.

859, O. BREVISTYLIS, DC. (Hairy Sweet Cicely.)

Rich woods, Common, Smaller than the last, Styles very short, inconspicuous, May—4, (B)

PEUCEDANUM, Hog Fennel,

882. *P. sativum*, Benth, & Hook, (Parsnip.)
Pastinaca sativa, L.

Low ground and by waysides, Introduced, Ju,—4, (B)

HERACLEUM, L, Cow Parsnip,

883, H, LANATUM, Michx.

Low ground near Rockcliffe (*J. A. Guignard*). Casselman (*J. F.*) Ju.—3, A tall handsome plant, Rare in this locality.

DAUCUS, Tourn. Carrot.

887, *D. Carota,* L. Cultivated Carrot,

Introduced. Thoroughly established and spreading in some localities, Ironsides. Billings Bridge. July—2,

ARALIACEÆ—Ginseng Family.

ARALIA, Tourn,

889, A. RACEMOSA, L, (Spikenard,)

Rich low woods and swamps. July—1. (B)

890. A. HISPIDA, Vent. (Bristly Sarsaparilla, "Dwarf Elder,")

Rocky and Sandy woods, Ju,—3,

891. A. NUDICAULIS, L. (Wild Sarsaparilla,)

Rich damp woods, May—4, (B)

892, A, QUINQUEFOLIA, Decsne. (Ginseng,)

Rich low woods, Rare and local, Beechwood, Powell's Grove, Billings Bridge, A fine species with bright scarlet berries. July—1,

893, A, TRIFOLIA, Decsne, (Dwarf Ginseng, Ground-nut,)

Rich woods, May—2, (B)

CORNACEÆ—Dogwood Family.

CORNUS, Tourn, Cornel. Dogwood,

895. C. CANADENSIS, L, (Bunch-berry. "Pigeon-berry.")

Sandy woods. A charming plant. Ju.—1, (B)

900. C, CIRCINATA, L'Her, (Round-leaved Cornel.)

Rocky woods, Ju.—4, (B)

A handsome species with large leaves, which are white beneath, and bluish berries.

901. C. SERICEA, L. (Silky Cornel.)

River bank. Parliament Hill, Britannia, Rare, Often confounded with the next, and sometimes difficult to separate. The leaves are more pointed and more pubescent. The cymes and flowers are a little larger and the buds are more inflated at the base,

902. C. STOLONIFERA, Mx. (Red-osier Dogwood.)
Wet places. Common. Growing in large clumps. Young branches bright red. Ju.—2. (B) This is the "Kinnikinik" of the Indians on the great plains.

905. C. PANICULATA, L'Her. (Panicled Cornel.)
Sandy woods and river banks. Rare. Hull. Aylmer. Casselman. Easily distinguished by the taper-pointed ovate-lanceolate leaves and the pyramidal cymes. Ju.—4.

906. C. ALTERNIFOLIA, L.
Rocky woods and thickets. Not uncommon. Ju.—1. (B)
A small tree with a flattish top. Branches greenish-grey streaked with white, alternate. Cymes white, large and showy, with red stems. Rather a difficult species for beginners to identify.

GAMOPETALOUS EXOGENS.

CAPRIFOLIACEÆ—Honeysuckle Family.

SAMBUCUS, L. Elder.

909. S. RACEMOSA, L. var. PUBENS, Watson. (Red-berried Elder.)
S. pubens, Mx.
River sides and rocky thickets. May—4. (B)

910. S. CANADENSIS, L. (Black-berried Elder.)
Low thickets. July—1. (B)

VIBURNUM, L. Arrow Wood.

911. V. LENTAGO, L. (Sheep-berry.)
River sides and low thickets. May—3. (B)

912. V. CASSINOIDES, L.
V. nudum, var. *cassinoides*, T. & G.
Swamps and low woods. Ju.—2.

914. V. PUBESCENS, Pursh. (Downy Arrow-wood.)
Rocky woods. An ornamental shrub. Ju.—2.

915. V. ACERIFOLIUM, L. (Maple-leaved Arrow-wood.)
Thickets and woods. Ju.—3.

917. V. OPULUS, L. (High-bush Cranberry. "Guelder Rose.")
Low thickets and river sides. Rather uncommon. Casselman. Aylmer. Britannia. Billings Bridge. July—2. (B)

918. V. LANTANOIDES, Mx. (Hobble-bush.)
Cool or rocky woods. Stewarton. Chelsea. May—2. (B)

LINNÆA.

919. L. BOREALIS, Gronov. (Northern Twin-flower.)
Cool woods and borders of swamps. Very common. Ju.—1. (B) Certainly one of our most attractive native plants, both for the grace of the delicate pink flowers with their exquisite scent and the beauty of the foliage.

SYMPHORICARPUS, Juss. (Snow-berry.)

920. S. RACEMOSUS, Mx. var. PAUCIFLORUS, Robbins.
Rocky banks. Along both banks of the Ottawa. July—2.

LONICERA, L. Honeysuckle.

924. L. HIRSUTA, Eaton. (Yellow-flowered Honeysuckle.
Rocky woods. Rare. Hull (*J.F.*) March (*A. H. Moore*). July—2

926. L. GLAUCA, Hill. (Smooth Honeysuckle.)
L. parviflora, Lam.
Rocky banks and woods. A straggling shrub with glaucous leaves and small clusters of flowers purple or greenish purple outside and yellow inside. Ju.—1. (B)

928. L. CILIATA, Muhl. (Fly Honeysuckle.)
Damp and rocky woods. May—3. (B)

930. L. OBLONGIFOLIA, Hook. (Swamp Honeysuckle.)
Peat bog. Mer Bleue. Rare. July—4.

931. *L. Tartarica*, L. (Garden Fly Honeysuckle.)
Escaped from cultivation. Not uncommon in woods. Beechwood. Hemlock Lake. Stewarton. June.

DIERVILLA.

932. D. TRIFIDA, Mœnch. Bush Honeysuckle.
Rocky banks and woods. Ju.—2. (B)

TRIOSTEUM.

933. T. PERFOLIATUM, L (Fever-wort. Horse Gentian.)

Rich woods and low meadows. Chelsea. Casselman. Ju.—1. (B)

RUBIACEÆ—Madder Family.

CEPHALANTHUS, L. Button-bush.

934. C. OCCIDENTALIS, L. (Button-bush.)

Alluvial banks of streams. July—2. (B)

MITCHELLA, L. Partridge-berry.

937. M REPENS, L. ("Twin-flower.")

Dry woods, particularly under *Coniferæ*. An interesting little plant with dark shining foliage, and bright scarlet berries each of which is formed from the joined ovaries of a pair of flowers. July—1.

GALIUM, L. Cleavers. Ladies' Bed-straw.

938. G. APARINE, L. (Goose-grass,)

Fields and borders of woods. Uncommon. Billings Bridge. Hull. Mer Bleue The Canadian plant is a smaller and slenderer form than the English, with smaller fruit. July—1.

939. G. ASPRELLUM, Mx. (Rough Bed-straw.)

Low ground. Common. July—1. (B)

941. G, TRIFIDIUM, L. Small Bed-straw.

Low grounds in swamps and wet woods. A very variable species.

942. G. TRIFLORUM, Mx. (Three-flowered Galium.)

Cool woods. Very common. May—4. (B)

945. G. CIRCÆZANS, Mx. (Smaller Wild Liquorice.)

Dry open wood beyond Beechwood Cemetery. Rare. Ju. —2.

946. G. LANCEOLATUM, Tor. (Wild Liquorice.)

Rocky woods. Uncommon. Chelsea. Hull. Hemlock Lake. Ju.—1

950. *G. verum*, L. (Yellow Bed-straw.)

Introduced. Two miles from Ottawa along the Montreal Road are two large patches of this plant, one in the Roman Catholic Cemetery, the other in a meadow. It is evidently well established and is increasing. (*R. B, Whyte*)

SHERARDIA, L. Blue Field Madder.

951. *S. avensis*, L.

Introduced. Roadside. Gathered two years in succession upon Friel street. (*H. M. Ami*).

COMPOSITÆ—Daisy Family.

EUPATORIUM, L. Thorough-wort.

959. E. PURPUREUM, L. var. MACULATUM, Darl. (Joe-Pye Weed.)

E purpureum, L. in part of Gray's Manual.

Low woods and meadows. July—4. (B)

960. E. PERFOLIATUM, L. (Boneset,)

Low woods and meadows. July—4. (B)

961, E. AGERATOIDES, L. (White Snake-root.)

Rich damp woods. A lovely species well worthy of cultivation. Aug.—1. (B)

SOLIDAGO, L. Golden Rod.

980. S. SQUARROSA, Muhl.

Rocky woods & ravines, An erect handsome species. Aug.—1, (B)

981. S, CÆSIA, L.

Rich woods. Billings Bridge. Found only in the above locality (*Miss Isabel Grant*). Aug.—1.

———— var. AXILLARIS, Gray.

Mountain woods, Hull. Chelsea, &c, Aug,—1.

This is the common form of this beautiful species—the short spikes springing from the axils of the upper leaves.

982. S. LATIFOLIA, L.

Rich woods and borders of ravines. A fine species. Aug.—1.

983. S. BICOLOR, L. (Soft Golden-rod.)

Dry rocky woods and river banks, Rockcliffe. Rare, Aug.—1. (B) Flowers cream-coloured.

———— var. CONCOLOR. T. & G,

Rocky woods. Common. Larger than the type. Inflorescence more frequently branching. Flowers yellow, Aug,—1.

992. S. ULIGINOSA, Nutt. (Swamp Golden-rod.)
Swamps. Mer Bleue. Swamp on King's Mountain. Aug.—3. An almost smooth species with an erect plumose panicle of bright yellow flowers.

995. S. RUGOSA, Mill. (Rough Golden-rod.)
S. altissima, Hook.
Fields and woods. Aug.—1. (B) The whole plant covered with short coarse pubescence.

996. S. NEGLECTA, T. & G.
Wet clay bank along the Gatineau at Ironsides. Rare. Aug.—2.

998, S. ARGUTA, Ait.
S. Muhlenbergii, T. & G. and of Gray's Manual.
Rocky woods. Kirk's Ferry. Aug.—2. Root-leaves large, thin and smooth. Panicle erect, but open.

999. S. JUNCEA, Ait.
S. arguta, T. & G. and of Gray's Manual.
Sandy and rocky woods. Near St. Louis Dam and Kirk's Ferry. Rare. Aug.—2. Root leaves smaller and narrower. Stems red, Panicle corymbose, with long drooping racemes.

1001, S. SEROTINA, Ait.
S. gigantea, T. & G. and of Gray's Manual.
Borders of woods. Common but not abundant. Aug.—1. (B) Leaves quite smooth on both sides. Panicle pubescent.

———— var. GIGANTEA, Gray.
S. serotina, T. & G. and of Gray's Manual.
Rocky woods. Commoner than the last. Aug.—1. Leaves hairy on the veins beneath.

1004. S. CANADENSIS, L. (Common Golden-rod.)
Woods and fields. Aug.—1. (B) Our commonest species extending under one form or another from the Atlantic to the Pacific. As represented at Ottawa the plants may be divided into three forms, ranging from almost smooth to softly downy. One of the most striking is

S. **Canadensis**, L. var. **procera**, T. & G.

This is a tall, softly pubescent, almost canescent form, generally found in low ground. Although very distinct, it grows with the other forms.

1005. S. **nemoralis**, Ait.

Dry sandy fields. Aug.—1. A dwarf rough species.

1010. S. **lanceolata**, L.

Low wet ground. July—3. (B)

ASTER, L. Star-wort.

1017. A. **corymbosus**, Ait.

Shady woods. Rather rare, July—4. Leaves large and thin stem slender and weak.

1018. A. **macrophyllus**, L. (Large-leaved Aster.)

Rocky open woods. Common. Aug.—1. (B) Leaves large, thick and rough; stems stout and rigid.

1033. A. **cordifolius**, L.

Woodlands and thickets. Aug.—1. (B) A showy species well worthy of cultivation. This and the next are the only species found here with the lower leaves all cordate.

1034. A. **Lindleyanus**, T. & G.

Woodlands and thickets. Aug.—1. Usually taller and slenderer than the last. The stem-leaves with margined petioles and the mid-rib with a fringe of long soft hairs beneath.

1041. A. **paniculatus**, Lam.

Low ground. Aug.—2. (B)

Under this species are now grouped all the forms formerly included in *A. simplex*, T. & G. and *A. tenuifolius*, T. & G. In it is included all the forms occurring here with smoothish, very much branched stems, and with long narrow leaves and whitish flowers. I cannot help thinking that Dr. Gray has brought together too many forms under this name.

1042. A. **diffusus**, Hook.

A. miser, T. & G.

A. miser, T. & G. var. *hirsuticaulis*. T. & G.

Low ground. Aug.—1. (B)

This name also now covers a multiplicity of forms of very different

ELEMENTARY LECTURE—PALÆONTOLOGY.

By Walter R. Billings.

(Read January 20th, 1890.)

A fossil (from *fossus* the Latin for "dug up") Lyell defines as "any body or *the traces of the existence of any body*, whether animal or vegetable, which has been buried in the earth by natural causes."

What these natural causes were is a question which has engaged the attention of thoughtful men from early historical times, and so far back as 5 centuries before Christ, Zenophanes of Colophon (500 B.C.), Herodotus, and Empedocles of Agrigentum (450 B.C.), followed somewhat later by Aristotle (384-322 B.C.), appreciated to some extent the true character of, and gave rational explanations concerning, the presence of these remains. They concluded that when the bottom of the sea had been in a soft condition that the remains were entombed, and that the sea, deserting some lands and invading others, had brought the earlier sea bottom within reach of easy inspection. Aristotle's opinions concerning the spontaneous generation of animals, which he believed could originate from moist earth or the slime of rivers was applied by his followers to fossils as well, for it seemed to them a much simpler way of accounting for the remains of animals in the rocks, than the marvellous changes of sea and land otherwise required to explain their presence, and this view later on obtained credence more readily, owing to its accordance with the Biblical theory of the creation of man out of the dust of the earth. The Romans merely repeated the ideas of the Greeks on this subject, some holding with the earlier writers, others with Theophrastus, the pupil of Aristotle, that they were produced by a certain plastic virtue latent in the earth until, near the close of the second century, we find Tertullian instancing the remains of sea animals on the mountains far from the sea as proof of the general deluge recorded by Moses.

During the thirteen or fourteen centuries onward from the close of the second century all departments of knowledge were enveloped in darkness, and no attention was paid to fossils excepting that occasional repetitions of the ideas of the ancients were made without appreciation or any special show of interest.

In the beginning of the sixteenth century the study of fossil remains may be said to have really begun. Leonardi da Vinci, the renowned artist and scientist, and Fracastro, of Verona, both maintained that the fossils were entombed in the sea mud instead of being sports of nature generated by fermentation through the influence of the stars or by spontaneous generation, theories which were thus for the first time seriously questioned, and which, in spite of all opposition, retained a dominant influence for two centuries later. Some claimed that the shells had been left by Noah's deluge, but, in opposition, Fracastro offered a mass of evidence which, although to us apparently conclusive, was not in accordance with the predominant theory of the time, and was in consequence fiercely assailed. He considered that inundation too recent and too transient; it consisted mainly of fresh water, and any organic remains resulting therefrom would necessarily be found in superficial deposits instead of in the interior of mountains.

And Fabia Colonna appears to have been the first to point out that some of the fossil shells found in Italy were marine and some terrestrial. However, these correct generalizations were the exception, not the rule, for during the sixteenth century fossils were usually considered as "sports of nature." The eminent botanists, Tournefort and Camerarius, believed in the dissemination of the seeds of minerals and fossils throughout the sea and the earth, and in the subsequent development into the characteristic forms by augmentation of atoms or particles as in crystals, stalactites, and stalagmites. Lhwyd, in his Lithophylacii Brittanici Ichnographia (Oxford, 1599), taught that the spawn of marine animals, after being raised with the vapors from the sea, conveyed inland by and precipitated from clouds, permeated into the interior of the earth where they produced the fossils. In addition to these there is the theory popular for many centuries, and now not entirely thrown aside although never a favourite with scientists, viz., that fossil animals and plants were formed by the Creator just as they are found in the rocks in pursuance of a design beyond our comprehension.

In the seventeenth century by means of collection, description and discussion of fossils the study was considerably advanced, and, although the "sports of nature" theory was still "on deck" up to the end of the century, clear ideas began to prevail and the study to advance rapidly. Steno, a Dane, to whom are owing many important views in regard to the origin of different kinds of strata, first recorded the fact that the oldest rocks are unfossiliferous. In spite of the advance in knowledge the general belief was that fossil remains were deposited by the Mosaic deluge, and this belief being opposed by courageous men and the conflict as to the nature of the fossils being fairly settled, the ground of discussion was transferred to Noah's flood, and until the close of the eighteenth century the theologians had their own way—they pointed out that Noah's deluge was universal, that all life, except what Noah saved, was destroyed, and that it followed that fossils were relics left by the flood. Several dissented, Voltaire and Buffon among the number, but the latter being politely invited by the College to recant and fearing the delicate attentions of his opponents, recanted accordingly.

The beginning of our century marked the commencement of the study of fossils as a science, and the advance since then—and for the first time in history—has been rapid and continuous. I regret we have not time to refer to its triumphs in detail.

This brings us back to Lyell's definition of a fossil as "any body or *the traces of the existence of any body*, whether animal or vegetable, which has been buried in the earth by natural causes." At first all objects dug up, whether organic or mineral, were called fossil, but when organic remains became generally understood the distinction was made. Palæontology is a modern term, which first came into use in 1830. Petrifactions form the most numerous class of fossils, being actual portions of animal or vegetable organisms, such as the shells of molluscs, the skeletons of corals, the crusts of crustaceans, the bones, teeth and scales of fish, the bones and teeth of reptiles and mammals, the bark, leaves or seeds of plants, "and these may be preserved very much in their original condition, or may be altered subsequent to their burial." But, in addition to these two principal kinds, there are the *traces* referred to in the definition quoted, among which traces are the moulds or casts of shells, and the footprints left by animals upon sand or mud. The "*alterations subsequent to their burial*" are usually replacements which either show intimate structure as well as in the original, or fail to do so, the failure or success being proportionate to the rapidity or slowness of decay. The soft or fleshy parts in all cases disappear.

There is a popular fallacy that the human body sometimes turns to stone after burial, and this error is owing to the fact that the fat and muscular tissues change after death to a waxlike substance called adipocere, which being tolerably firm, often preserves the form and features of the body in a more or less perfect condition for a few years after death, but this only retards, not prevents, the final and complete decomposition of the soft parts.

Moulds or casts may be either of the interior or of the exterior of the shell of the mollusc, the cup of a coral or crinoid, or the skeleton of any organism possessing such.

Taking as an example the shell of a mollusc which, after being filled with mud and buried in the ocean bed, was subjected to influence which dissolved out the shell—an interior and exterior cast, with an empty space between, would be the result. However, it is very rarely that a cavity is left, as in any porous matrix mineral particles would be deposited until a filling is formed. A familiar instance of a cavity or mould is that of a citizen of Pompeii found during the excavation of the streets of that city. The man had probably been suffocated in the showers of ashes from Vesuvius. A plaster cast was made of the cavity, and the form of the Pompeiian restored to human gaze after a lapse of 1,800 years.

Through careful oberservation of readily accessible rock masses in various countries as to their super-position, mineral characters, and included fossils, geologists have been enabled to break up the entire stratified series into a number of different divisions or formations, each characterized by general uniformity of mineral composition, by peculiarity of position with regard to the others and by a peculiar assemblage of fossils; and further, to break up each of the primary divisions into a series of smaller ones similarly characterized and distinguished. In no known locality can all these rock groups be seen surmounting one another in uninterrupted succession. There are localities where representatives of the Cambrian, Silurian, Old Red and Carboniferous are to be found following one another in regular succession. But, on the other hand, there are localities where the Carboniferous rests on the Silurian and the Old Red is absent, and this may have been owing either to the elevation of the Silurian beds above the sea immediately after their deposition and their remaining so until the Old Red period had passed; or to the Old Red having been deposited on the Silurian, the whole elevated above the sea and subjected to denudation sufficient to remove the Old Red; in either case when the land was again submerged the formation then in process of deposit would be laid down directly on the Silurian. One thing should be carefully noted, viz., that the rocks never occur in an inverted order, *i.e.*, no one of the Cambrian beds is to be found resting on any of the Silurian, nor any of either of these on a representative of the Old Red.

As each superimposed stratum is older than that underlying it, so the fossils contained in an overlying bed are less ancient than those in the bed beneath, and thus the succession of organic remains are the evidences of the growth and development of living forms.

As aforesaid, each formation and each of its subdivisions is characterized by a peculiar assemblage of fossils, and, owing to this, when we find the peculiar assemblage repeated, we know that we have a repetition of the formation in which it was originally discovered; and thus a knowledge of the fossils contained in any particular bed or group of beds, enables us to determine the relative age and position of the beds compared with other beds in the same region or other regions. How far this test may be applied with certainty to minor rock groups or sub-divisions, we have not time here to consider, but its value to determine formations has never been questioned. Further, although the combination or assemblage of fossils is peculiar to that formation or sub-division, each fossil of it is not, for it may go on upward through several formations before it disappears: one thing, remember, that when it once disappears it never reappears.

Let us suppose that in any one country we discover the order and relative succession of the rocks, and that we have examined and noted the mineral character of the beds as well as the fossils they contain. Now to identify any outlying beds throughout the neighbourhood, the mineral character alone would be a sufficient means of identification for most of the beds, while superposition would do for the remainder. But to determine the stratigraphical position of rocks in a far off region from mineral evidence obtained in this country would be vain—here a comparison of the fossils would be the only reliable test. For instance, the mineral character of our Trenton group of rocks at Ottawa is sufficiently constant to make it a good test almost anywhere within a radius of 200 miles, and where the least doubt arises, superposition would be another ready means; but the Trenton group of Missouri, for instance, is of a beautiful creamy-buff dolomite, very unlike our ugly sad-coloured limestone, and here we have to fall back on our fossils for light as to the age of the rock.

As a proof of the great value of fossils as evidence, I quote the evidence of Dr. Hall, New York State Geologist, given in 1854, before a select committee of the House of Commons of Canada, as follows:—"One of the great practical advantages resulting in New York I conceive to have been the proof that no valuable or workable coal exists within the State. This fact, although of a negative character, has for ever set at rest all explorations for coal, while it has been ascertained that during fifty years previous to the commencement of the survey not less than one million of dollars had been expended in abortive search for fossil-fuel, where a well-informed geologist would have at once pronounced the undertaking useless and certain to prove a failure." Through a study of the fossils it was established that in New York "both salt and gypsum are products of the * * * Silurian Period, while previously it had been believed they belonged to the New Red * * and consequently that coal would be found in these rocks as in Europe * * * The evidence from fossil character soon proved the futility of such an expectation. Thus, in this instance, *mineral evidence* set the public wrong and *fossil evidence* corrected the error. Again the occurrence of the rock known as the Oneida Conglomerate was, from its mechanical structure, believed to be identical with the Millstone Grit of England, which underlies the coal, and examinations for coal were * * to some extent made. From the fossils in the rocks above and below it has been proved to belong to the older Silurian beds. Thus, in this case also, mineral evidence misled the public, and fossil evidence corrected the error." * * * *

An instance in which a knowledge of the fossil remains of a formation was of still greater importance than a knowledge of its mineral character is the lead-bearing formation of the States of Wisconsin, Illinois and Iowa. For many years a serious misapprehension existed in regard to the true position of the lead-bearing rock; and only so lately as 1850 was it determined by a proper examination of its fossils that instead of being in the Niagara group, as formerly supposed * * * it belonged to the Lower Silurians." Since this discovery, miners search for lead in those rocks only where the characteristic fossils occur.

"Miners of coal and other products recognize the surrounding strata, and determine their proximity to the productive by the presence of certain fossils well known to them at sight."

The formation of the Geological Survey of Canada put a stop to much useless expenditure in the same way, and proofs of the non-existence of workable beds of coal throughout the old provinces of Upper and Lower Canada, due to the labours of the Survey, put a stop to many futile researches after that mineral and the consequent waste of money. At Gaspé and at Owen Sound in those early days parties were prevented from sinking shafts in bituminous shale by Mr. Logan, whose knowledge of the fossils told him there could be no coal there; although practical colliers had declared in favour of its occurrence. Such instances, however, could be multiplied but our time does not permit.

Besides enabling us to determine the relative age and position of each deposit in which we find them, they enable us to arrive at the mode of deposit and the condition of the district or region at the time of its formation. If it contains the remains of animals such as now inhabit rivers, we know that it must have formed part of a river bed or been deposited by the overflow of a stream; if it contains remains of molluscs, fish or crustaceans such as inhabit lakes, we know it was deposited beneath a lake; and if it contains marine animals or seaweeds, we know it was a sea bottom.

We may go more minutely into the matter than this, for if the fossils resemble those now inhabiting shallow seas, or if they are rolled and broken and accompanied by remains of land organisms, there can be little doubt they are a shore deposit or were laid down in a shallow sea in the vicinity of the coast; but if the remains are those of deep sea organisms mixed sparingly with extraneous forms, a deep sea origin may be decided upon. In some cases we find an ancient coral reef, in others a bed of social shells like the oyster, each case telling a tale not to be mistaken. Occasionally there are beds of dwarfed marine species telling of a brackish sea, and others related to those we find in estuaries at the present time. You will observe that the remains mentioned are aquatic organisms only, but all these deposits contain, in more or less degree, ærial and terrestrial animals and plants. Many of these frequented the seas and lakes, and their remains readily found place in the deposits pertaining thereto, while others have been drowned in lakes or rivers and have been carried out to sea by streams. Some remains of land animals occur in "sub-aerial" deposits, such as blown sand accumulations on the land.

And, further, we may form a fairly reliable opinion of the climate which obtained during the deposit of these, thus, *e.g.*, the Eocene deposits of Greenland, a country now buried under ice, contain the trees, shrubs and plants of the temperate regions—the Eocene of Western Europe contains remains of cowries, volutes and palms closely related to those found in combination with a mean temperature 30° warmer than at present.

As has been stated the various formations are characterized (1) by the association of certain fossils, (2) by the predominance of certain families or genera, or (3) by an assemblage of fossil remains representing the life of the period in which the formation was deposited. But the record of the life of the whole series from bottom to top is not an uninterrupted one, and this "imperfection of the Palæontological Record," as it is termed, is to be regretted, because our knowledge of prehistoric life is almost entirely limited to the palæontological evidence at our disposal. At the outset is what is known as "unrepresented time" or better, perhaps, as "the imperfection of the Geological Record," owing to the fact that many missing or undiscovered rock groups are buried beneath others or beneath the waters of the sea out of sight; that a large portion of the earth, including two great continents, is as yet unexplored; and also that denudation has played the same havoc with the deposits of bygone ages that it has played with those of to-day.

No better example of "unrepresented time" can be had than that oft-quoted break in the strata of Great Britain between the secondary and tertiary epochs. In the upper cretaceous beds there are 500 species of described fossils, and of these only one brachiopod and a few foraminifera have yet been detected in the overlying eocene beds. The explanation of this is that the break in the life of these two periods represents an incalculable lapse of time. The cretaceous area was elevated and its fauna emigrated ; when it was again depressed the lapse of time was so great that the life which immigrated then from neighbouring seas was composed of new forms. Indeed, the eroded character of the cretaceous rock upon which the tertiary was laid down would in itself prove the great lapse of time.

But "the imperfection of the Geological Record" accounts for only some of the causes of "imperfection of the Palæontological Record," for, if the series of sedimentary rocks had been preserved to us in its entirety and open to our inspection, there would yet be the deficiencies owing to (1) the facility with which different animals may be preserved as fossils, (2) the liability to be deposited where they may be preserved, and, finally, (3) the liability to be obliterated or destroyed after being deposited.

To the varied facility with which different animals may be preserved as fossils, enormous deficiencies in the palæontological record are due. In the polyzoa, cœlenterata, anneloida and annulosa a large proportion, comprising entire classes possess no hard parts, and consequently are unrepresented as fossils, and even in the mollusca and vertebrata some families are lost to us through the same cause. Birds, owing to their lightness, float after death on the water until devoured, and mammals, the majority of which live on land, have fewer opportunities of being buried in aqueous accumulations, consequently are not so often represented as those forms which are essentially marine.

In addition to these is the disappearance of fossils from rocks originally fossiliferous. Metamorphism or the subjection of the rock to a sufficient heat to cause rearrangement of the particles, and consequently an obliteration of the fossils, is the chief cause to which we have to look for the irreparable loss of an enormous mass of palæontological evidence. The life of the great Laurentian series of rocks comprising 30,000 feet (say 6 miles) in thickness of sediments, has been entirely blotted out by this cause. Another cause of obliteration is the percolation of water holding carbonic acid (rain water, for instance) through sand or loose rock.

Lack of time forbids my consideration of such interesting matters as "zones," "the doctrines of colonies," and other interesting divisions of this portion of the subject.

An important part in the formation of rock masses has been played by fossils, for although the sand and clay rocks have not been shown to be of organic origin, yet the greater part of the lime rocks, some of the flint rocks and all the coal and blacklead, with presumably the phosphates, were built up of the remains and through the agency of the animals and plants of the periods of their deposition.

The greater part of the limestones and chalks are compact masses of organic remains of corals, molluscs, echinoderms, foraminifera, calcareous algæ, and other organic forms which possessed lime skeletons. Many flinty deposits are due to polycystina, diatoms and sponges, and the coal, blacklead and other forms of carbon have undoubtedly been produced through the agency of plants.

It is not generally known that geology originated from a study of fossils, and that without palæontology there would have been no science of geology—that is to say, palæontology was the foundation, not a branch, of geology.

Zoology and botany also owe much to the study of fossils. The classification of both animals and plants has been rendered much more nearly complete, through the insertion of many intermediate orders, the blastids, the cystids, the cyclocystids, the peculiar palæozoic starfishes, the receptaculites, the trilobites, the eurypterids, the many orders of fishes from the old Red, the labyrinthodonts, the wonderful reptiles of the secondary, the odontoterms or toothed birds, including the archæopterix (a bird with a tale of a reptile), the strange Eocene mammals and ungulates, the extinct marsupials of Australia and edentata of South America, and the Pliocene hippopotami of Asia and Africa are some of the examples.

Vertebrate palæontology has furnished data for some fairly well proven genealogies of various existing animals, especially of the large mammals, which have been traced back through allied forms, in a closely connected series to early tertiary times. In several cases, notably in that of the horse, the series are so complete that there can be little doubt that the line of descent has been demonstrated.

Comparative anatomy and embryology owe much to the study of fossils, especially a greatly enlarged knowledge of the vertebrate skull, the limb arches and the limbs, together with the law of brain growth, found to exist among extinct mammals and other vertebrates, which law Marsh, its discoverer, states as follows:—"All tertiary mammals have small brains. There was also a gradual increase in the size of the brain during this period. The increase was confined mainly to the cerebral hemispheres, or higher portions of the brain. In some groups the convolutions of the brain have gradually become more complicated. In some the cerebellum and olfactory lobes have even diminished in size." Since this general statement further research has shown "that the same general law of brain growth holds good for the birds and reptiles from the Secondary epoch to the present time," and the facts so far gathered indicate that as a general law this will hold good for all extinct vertebrates.

To Archæology also, Palæontology has rendered great service in extending our knowledge of the antiquity of the human race. Evidences which after having long accumulated to be rejected merely because not in accord with accepted theories, have been during this century re-examined and added to, until now they are strong enough to make the conclusion inevitable that the occurrence of the remains of man in the Pliocene now fairly establishes the fact of the existence of man in that period.

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REPORT OF THE CONCHOLOGICAL BRANCH.

(Read March 13, 1890.)

The leaders of the Conchological Branch have to report that they have personally been able to do little work in the field during the past season, and they are not aware that any other members of the club resident in Ottawa have taken up the study. This is greatly to be regretted for, as will be seen from the present report, much remains to be done before the list of Ottawa mollusca can be considered complete.

A very prolific locality (the wood between St. Louis dam and the Experimental Farm) was visited by the writers on one or two occasions, and in moss collected there many interesting though minute land shells were found—*Pupa contracta, Vertigo pentodon, V. curvidens, V. ovata, V. Gouldii* (very common), *V. simplex, V. Bollesiana, Zonites milium, Z. exiguus*, etc., etc.

In a little wood near the Canada Atlantic Railroad at Archville *Zonites minusculus* and *Binneyanus* were found, together with *Punctum pygmæum* in some numbers, and *Pupa contracta, Vertigo ovata, V. Bollesiana* and *V. pentodon.*

At the outlet to Leamy's Lake, a capital locality, were found, *Sphærium rhomboideum, S. partumeium* and other freshwater shells and a small *Pisidium* there taken is thought by Mr. Latchford to be *P. rotundatum,* new to our lists.

But though little field work has been done, the leaders have devoted considerable time to the study of the species in their collections, and they have reached the conclusion that some alterations are necessary in the Ottawa lists. This is specially the case in puzzling groups such as the Amnicolæ and Pupidæ, and papers on the local species of these groups are in preparation.

Up to the present time there have been recorded in the transactions of the club, 126 species of land and freshwater mollusca. Of these the writers are of opinion that 5 must be dropped :—

Amnicola Sayana, Anth.—Tr. I. iii, 57. These were *A. granum,*

A. decisa, Hald. —Tr. I. iii, 57. These were *A porata.*

Limnæa lanceata, Gould.—Tr. I. iii, 58. These were *L. stagnalis,* young.

Physa brevispira, Lea.—Tr. I. i. 39, 62. These were *P. Billingsii.*

Planorbis lentus, Say.—Tr. I. i. 39. These were *P. trivolvis.*

In place of these, 6 other species can now be added :—

Sphærium stamineum, Conrad. Rideau River at rifle range.

Pisidium rotundatum, Prime. Outlet to Leamy's Lake.

Amnicola Cincinnatiensis, Anth. Rideau Canal.

Amnicola pallida, Hald. Local specimens of this species are in the Geological and Natural History Survey Museum.

Vertigo curvidens, Gould. Woods near St. Louis dam.

Helix dentifera, Binney. The Ox-bow farm, Casselman.

The number of species on the list is now, therefore, 127, namely :— Freshwater bivalves, 41; freshwater univalves, 39; land shells, 47.

There are, however, some species about which the writers are very doubtful, and which may eventually have to be dropped.

Appended to this report is the Ottawa list of land and freshwater mollusca as it at present stands.

References are added to the pages in the Transactions on which the species are recorded or referred to, and a ? is prefixed to all names that are still in any way doubtful.

GEO. W. TAYLOR,
F. R. LATCHFORD.

NOTE.—The papers with reference to Ottawa Land and Freshwater Shells that have been published in the Transactions of the Club up to date are as follows:—

Heron, G. C.—On the Land and Freshwater Shells of the Ottawa. Trans. vol. I, pt. i, p. 36 and 62.

Latchford, F. R.—Notes on the Ottawa Unionidæ. Trans. vol. I, pt. iii, p. 48.

Latchford, F. R.—Observations on the Terrestrial Mollusca of Ottawa and vicinity. Trans. vol. II, p. 211.

Small, H. B., and Symes, P. B.—Report of Conchological Branch for 1881. Trans. vol. I, pt. iii, p. 57.

Poirier, P.—Report of Conchological Branch for 1882. Trans. vol. I, pt. iv., p. 74.

Latchford, F. R., and Poirier, P.—Report of Conchological Branch for 1883. Trans. vol. II, p. 130.

Latchford, F. R., and Poirier, P.—Report of Conchological Branch for 1884. Trans. vol. II, p. 263.

Latchford, F. R., and Poirier, P.—Report of Conchological Branch for 1885. Trans. vol. II, p. 350.

Latchford, F. R.—Report of Conchological Branch for 1886. Otrawa Naturalist, vol. I, p. 107.

Latchford, F. R.—Report of Conchological Branch for 1887–88. Ot. Nat. vol. III, p. 65.

Taylor, G. W., and Latchford, F. R.—Report of Conchological Branch for 1889. Ot. Nat. vol. IV, p. 52.

List of the Land and Freshwater Mollusca of Ottawa as recorded in the Transactions of the OttawaField-Naturalists' Club, up to April 1st, 1890.

A.—FRESHWATER BIVALVES.

1.—Sphærium sulcatum, Lam. Trans. Ot. F. Nat. Club vol. I, pt. i, p. 40; II, 265-6.
2.— " striatinum, Lam. Tr. I, i, 40.
3.— " stamineum, Conr. Ot. Nat., vol. IV, p. 53.
4.— " rhomboideum, Say. Tr. I, i, 40.
5.— " occidentale, Prime. Tr. I, i, 40; Ot. Nat. I, 107.
6.— " partumeium, Say. Tr. I, i, 40.
7.— " secure, Prime. Tr. I, i, 40; II, 132, 264.
8.— " rosaceum, Prime. Tr. II, 351.
9.— " truncatum, Linsley. Tr. I, iii, 59.
10.—? Pisidium Adamsi, Prime. Tr. I, i, 40.
11.—? " compressum, Prime. Tr. I, i, 40.
12.— " abditum, Hald. Tr. I, i, 40; II, 264.
13.— " ventricosum, Prime. Tr. I, i, 40; II, 264.
14.—? " rotundatum, Prime. Ot. Nat. IV. 53.
15.—Unio complanatus, Sol. Tr. I, i, 40; iii, 49; II, 265, 266; Ot. Nat. I, 114; III, 65, 66.
16.— " gibbosus, Barnes. Tr. I, i, 40 (as dilatatus); iii, 50; Ot. Nat. I, 114; III, 66.
17.— " ellipsis, Lea. Tr. I, i, 40 (as U. olivarious); I, iii, 50; Ot. Nat. I. 114; III, 66.
18.— " rectus, Lam. Tr. I, i, 40; iii, 50; Ot. Nat. I, 114; III, 66.
19.—Unio radiatus, Lam. Tr. I, i, 40; iii, 50; II, 264.
20.— " luteolus, Lam. Tr. I, iii, 51; II, 265.
21.— " Canadensis, Lea. Tr. I, iii, 52.
22.— " borealis, A. F. Gray. Tr. I, iii, 52, pl. II, fig. 1, 2, 3; Ot. Nat. I, 114; III, 66.
23.— " cariosus, Lea. Tr. I, iii, 51.
24.— " occidens, Lea. Tr. I, iii, 51; Ot. Nat. I, 114; III, 65, 66.
25.— " subovatus, Lea. Tr. I, i, 40 (as cardium); I, iii, 51.
26.— " alatus, Say. Tr. I, i, 40; iii, 52; Ot. Nat. I, 114; III, 66.
27.— " gracilis, Barnes. Tr. I, iii, 52; Ot. Nat. I, 114; III. 66.
28.— " pressus. Lea. Tr. I, iii, 52; iv, 74.

29.—Margaritana marginata, Say. Tr. I, i, 40; iii, 54.
30.— " undulata, Say. Tr. I, i, 40; iii, 54; Ot. Nat. I, 114; III, 66.
31.— " rugosa, Barnes. Tr. I, i, 40 (as costata); iii, 54.
32.—Anodonta edentula, Say. Tr. I, iii, 55.
33.— " undulata, Say. Tr. I, i, 40; iii, 55; Ot. Nat. I, 114; III, 66.
34.— " subcylindracea, Lea. Tr. I, iii, 55.
35.— " Benedictii, Lea. Tr. I, iii, 55; II, 266.
36.— " Lewisii, Lea. Tr. I, iii, 56.
37.— " implicata, Say. Tr. I, iii, 56.
38.— " Footiana, Lea. Tr. I, iii, 56.
39.— " lacustris, Lea. Tr. I, iii, 56; II, 265.
40.— " fragilis, Lam. Tr. I, iii, 56; iv, 74; II, 265.
41.— " fluviatilis, Dillwyn. Tr. I, i, 40 (as cataracta); iii, 56; II, 263, Ot. Nat. III, 66.

B. —Freshwater Univalves.

42.—Campeloma decisum, Say. Tr. I, i, 39; II, 132, 263, 265, 266.
43.—Valvata tricarinata, Say. Tr. I, i, 39; II, 263.
44.— " sincera, Say. Tr. I, i, 39 (as humilis); II, 264.
45.—Amnicola porata, Say. Tr. I, i, 39; iii, 57; II, 265.
46.— " pallida, Hald. Ot. Nat. IV. p. 53.
47.— " limosa, Say. Tr. I, iii, 57.
48.— " Cincinnatiensis, Anth. Ot. Nat. IV. p. 53.
49.— " granum, Say. Tr. I, i, 39; iii, 57 (as Sayana, Anth.).
50.—? Pomatiopsis lapidaria, Hald. Tr. I, i, 39.
51.—Goniobasis livescens, Menke. Tr. I, i, 39; iv, 74.
52.—Limnæa stagnalis, Linn. Tr. I, i, 39; II, 131, 263.
53.—? " decollata, Mighels. Tr. I, i, 39.
54.— " columella, Say Tr. I, i, 39; II, 132.
55.— " megasoma, Say Tr. I, iii, 58; iv, 74.
56.— " palustris, Müll. Tr. I, i, 39 (as elodes and umbrosa); II, 264.
57.— " catascopium, Say. Tr. I, i, 39; II, 264, 266.
58.— " emarginata, Say. Tr. I, iii, 58; II, 264.
59.— " caperata, Say. Tr. I, i, 39; II, 264.

59*a*.—Limnœ—var. umbilicata, Adams. Tr. I, iii, 58.
60.— " desidiosa, Say. Tr. I, i, 39; II, 263, 265.
61.— " humilis, Say. Tr. I, i, 39.
62.— " gracilis, Jay. Tr. I, i, 39; 62, pl. II, f. 4.
63.—? " lepida, Gould. Tr. I, iii, 58.
64.—Physa Lordii, Baird. Tr. I, i, 39 and 62, pl. II, f. 3; iv. 74; Ot. Nat. III, 67.
65.— " gyrina, Say. Tr. I, iii, 58; II, 264.
66.— " ancillaria, Say. Tr. I, i, 39; II, 263. 264.
67.— " Billingsii, Heron. Tr. I, i, 39 (as brevispira, Lea); I, i, 62, pl. II, f. 5.
68.— " heterostropha, Say. Tr. I, i, 39; II, 264, 265, 266.
69.— " hypnorum, Linn. Tr. I, i, 39.
70.—Planorbis campanulatus, Say. Tr. I, i, 39; II, 263.
71.— " trivolvis, Say. Tr. I. i, 39; II, 263, 4, 5, 6, Ot. Nat. III, 67.
71*a*.— " —var. macrostomus, Whiteaves. Tr. I, i, 39; Ot. Nat. III, 67.
72.— " bicarinatus, Say. Tr. I, i, 39; II, 132, 266; Ot. Nat. III, 67.
73.— " exacutus, Say. Tr. I, i, 39; II, 264.
74.— " deflectus, Say. Tr. I, i, 39; II, 264, 265.
75.— " albus, Müll. Tr. I, i, 39 (as hirsutus); II, 266.
76.— " parvus, Say. Tr. I, i, 39.
77.—? " Billingsii, Lea. Tr. I, i, 39.
78.—Planorbis armigerus, Say. Tr. I, i, 39.
79.—Ancylus parallelus, Hald. Tr. I, iii, 58.
80.— " rivularis, Say. Tr. I, i, 39.

C.—LAND SHELLS.

81.—Selenites concava, Say. Tr. I, i, 40; II, 130, 212, 263.
82.—Limax agrestis, Müll. Tr. I, iv, 74; II, 131, 222.
83.— " campestris, Binney. Tr. I, i, 39; II, 131, 223.
84.—Vitrina limpida, Gould. Tr. I, i, 39; II, 222.
85.—Zonites (Mesomphix) inornatus, Say. Tr. I, i, 40; II, 212, 263, 264.
86.— " (Hyalina) nitidus, Müll. Tr. I, i, 40, 62, pl. II. f. 6; II, 131, 213.

87.—Zonites (Hyalina) arboreus, Say. Tr. I, i, 40; II, 213, 263, 264.
88.— “ “ radiatulus, Alder. Tr. I, i, 40 (as electrina); II, 213, 263, 264 (as viridula).
89.— “ (Hyalina) indentatus, Say. Tr. I, i, 40; II, 214, 264.
90.— “ “ minusculus, Binney. Tr. I, iii, 59; II, 214.
91.— “ “ milium, Morse. Tr. I, i, 40 note, 62, pl. II, f. 8; II, 130, 214.
92.— “ (Hyalina) Binneyanus, Morse. Tr. II, 214; Ot. Nat. I, 107.
93.— “ (Hyalina) ferreus, Morse. Tr. II. 215.
94.— “ “ exiguus, Stimpson. Tr. I, i, 40; II, 130, 214,
95.— “ (Conulus) fulvus, Drap. Tr. I, i, 40 (as chersina); II, 215, 263, 264.
96.— “ (Gastrodonta) multidentatus, Binney. Tr. I, i, 40; II, 215.
97.—Tebennophorus Carolinensis, Bosc. Tr. I, i, 39; II, 224, 265.
98.—? “ dorsalis, Binney. Tr. II, 264.
99.—Patula alternata, Say. Tr. I, i, 40; II, 215, 263.
100.— “ striatella, Anth. Tr. I, i, 40; II, 216, 263, 264.
101.— “ asteriscus, Morse. Tr. II, 130, 216.
102.—Helicodiscus lineatus, Say. Tr. I, i, 40; II, 216.
103.—Punctum pygmæum, Drap. = minutissimum, Lea. Tr. I, i, 40, 62, pl. II. f. 7; II, 221; Ot. Nat. I, 107.
104.—Helix (Mesodon) albolabris, Say. Tr. I, i, 40; II, 218, 264, 351.
105.— “ “ dentifera, Binney. Ot. Nat. IV. 53.
106.— “ “ thyroides, Say. Tr. II, 219, 265.
107.— “ “ Sayii, Binney. Tr. I, i, 40; iv, 74; II, 219, 263, 264.
108.— “ (Stonotrema) monodon, Racket. Tr. I, i, 40; II, 217, 263.
109.— “ (Vallonia) pulchella, Müll. Tr. I, i, 40; II, 221.
110.— “ (Strobila) labyrinthica, Say. Tr. I, i, 40; II, 217, 265.
111.—Pupa corticaria, Say. Tr. I, i, 40; II, 226.
112.— “ armifera, Say. Tr. II, 225.
113— “ contracta, Say. Tr. I, i, 40; II, 225, 265.
114.— “ simplex, Gould. Tr. I, i, 40; II, 227.
115.— “ milium, Gould. Tr. I, iii, 59; II, 130, 227.

116.—Vertigo ovata, Say. Tr. I, i, 40; II, 226.
117.— " Gouldii, Binney. Tr. I, i, 40; II, 130, 226.
118.— " Bollesiana, Morse. Tr. II, 226.
119.— " ventricosa, Morse. Ot. Nat. III, 68.
120.— " pentodon, Say. Tr. I, i, 40; II, 225.
121.— " curvidens, Gould. Ot. Nat. IV. 53.
122.—Ferussacia subcylindrica, Lin. Tr. I, i, 40 (as B. lubricus); II, 224.
123.—? Succinea aurea, Lea. Tr. I, iv, 74.
124.— " avara, Say. Tr. I, i, 39; II, 131, 229.
125.— " obliqua, Say. Tr. I, i, 39; II, 229, 263; Ot. Nat. I, 107.
126.—Succinea ovalis, Gould. Tr. I, i, 39; II, 130, 227, 265.
127.—Carychium exiguum, Say. Tr. I, i, 40.

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BOOK NOTICE.

The School Fern-Flora of Canada; by Prof. George Lawson, Ph.D. LL.D., F.R.S.C., pp. 221-251, 1889. We have to thank our esteemed member Dr. Lawson for a copy of his School Fern-Flora of Canada, which has been published as an appendix to a reprint of Dr. Asa Gray's "How Plants Grow," lately issued by Messrs. A. & W. Mackinlay, of Halifax, N.S. The whole volume containing both works will be supplied by the publishers for 75c, but a discount of 20% will be allowed if ten or more copies are taken. As is well known, Dr. Lawson has made a special study of our Canadian ferns, and there is no doubt that the publication of this paper will be welcomed by many of our members who are frequently enquiring for a small and intelligible work upon this favourite branch of our native flora. There are no plants which are so universally admired as ferns, and none of greater interest than those which grow wild in our northern woods and rocky ravines. Botanists and lovers of nature are now provided with a means of identifying any fern they may find growing wild, for this little work, which is illustrated by one plate upon which 17 genera are figured, "comprises descriptions of all ferns known to inhabit the Dominion together with an account of their geographical range or prevalence in the several Provinces, and special localities for the rarer species."

The author has adopted names for some of the genera and species which will be unfamiliar to our botanists who have worked with Gray's manual; but it is probable that in most instances these will be accepted; it seems a great pity, however, that the synonyms were not given for at least those species which appear in the Manual under other names. A little more information on the part of the author with regard to some of the localities, particularly those of this district, would decidedly have made the work more useful. These, however, are small defects which will probably be remedied in a future edition. On the whole Dr. Lawson's little book is a welcome addition to the works upon our Canadian flora.

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EXCURSION TO LACHUTE.

An invitation has been received from the Natural History Society of Montreal for the members of the Ottawa Field Naturalists' Club to join them upon their annual spring excursion.

The excursion this year is to be on Saturday, 7th June, to Lachute, on the Canadian Pacific Railway, a beautiful spot about 45 miles from Montreal, which experience has shown presents many attractions for students in every branch of natural history. Addresses will be delivered by Sir William Dawson, Prof. Penhallow, and other eminent naturalists.

Through the courtesy of Mr. W. C. VanHorne, President of the Can. Pac. Ry., tickets will be issued to members of our club and their friends at the low rate of $1.50 for the return trip. These tickets will be issued by the railway authorities, at the railway station or at the Sparks St. office, upon presentation of our club excursion tickets; these can be obtained from any member of the council (the names of all of whom appear on the cover of the Naturalist). As large a delegation as possible to represent the club is of course desirable.

The train leaves the Union Station at 7 o'clock A.M.

NEW MEMBERS.

(*Elected since the Annual Meeting, March 18th, 1890*).

Alexander, Mrs. J.
Alexander, Miss Isabel.
Angus, Miss L.
Bailey, Prof. L. W., *M.A.*, *Ph. D.*, *F.*R.*S.C.* (Fredericton, N.B.)
Baldwin, Miss E. G.
Baldwin, Miss H. A.
Bolton, Rev. C. E. (Wiarton, Ont.)
Borden, F. W., *M.D.*, *M.P.* (Canning, N.S.)
Brodie, R. J., *B. App. Sc.*, (Smiths Falls, Ont.)
Crawford, Mrs. Mary.
Darcy, Miss T.
Fisher, S. A., *M. P.* (Knowlton, Que.)
Fletcher, Miss C. F. S.
Gemmell, R. E.
Hardie, Miss Jessie.
Hay, W. H.
Henderson, Thomas.
Laflamme, Revd. J. A. K., *D.D.*, *F.R.S.C.* (Quebec).
Lovick, Miss G.
Matheson, W. M.
MacCabe, J. A., *LL.D.*
MacDougall, P. A., *M.D.*
McNaughton, H. F.
O'Brien, S. E.
Plunkett, J. M.
Robert, J. A., *B. App. Sc.* (Montreal).
Ryckman, Revd. E. B., *D.D.*
Saint-Cyr, D. N. (Quebec).
Saunders, W. E. (London, Ont.)
Saunders, Fred.
Senecal, C. O., *C.E.*
Smithson, Miss B. H.
Steckel, R., *C.E.*
Surtees, Robert.
Sweetland, John, *M.D.*
Topley, Mrs. W. J.
Waghorne, Rev. A. C. (New Harbour, N'f'l'd.)
Wait, F. G.
Weldon, Prof. R. C., *M.P.* (Halifax, N.S.)
Wood, Josiah, *M. P.* (Sackville, N.B.)

NEW CANADIAN MOSSES.

Described by Dr. Nils C. Kindberg, Linkoping, Sweden, 1889.

(Communicated by Prof. John Macoun, M.A., F.L.S., F.R.S.C.)

Dicranum rugosum, Kindb. N. sp.

Leaves very undulate, acute, from the middle dentate at the papillose borders; cells not rarely porose, the upper short, the others long and narrow, except the hyaline alar and the pale-yellow basal ones; costa narrow, subpercurrent, dentate at the back from the middle. Barren. Allied to *D. Shraderi.*—In damp woods near Halifax, Nova Scotia (June 21st, 1883). J. Macoun, Coll.

——Var. rugulosum, Kindb. N. v.

Differs in the leaves, being slightly undulate, subobtuse, canaliculate; the alar cells pale brown, the costa less dentate. Capsule oblique, evidently furrowed in a dry state.—In the Big Swamp, Murray, Northumberland Co., Ont. (October 10th, 1878.) J. Macoun, Coll.

Dicranum Drummondii, Bland, v. trachyneuron, Kindb. N. v.

Stems shorter than type. Leaves smaller, narrower and looser, more densely and evidently serrate on the borders, subuliform-cuspidate; alar cells yellow; costa not excurrent, rough also below the middle and upwards.—Cedar swamps at the base of the Oak Hills, Hastings Co., Ont. (August, 24th, 1876.) J. Macoun, Coll.

Desmatodon cernuus, Bruch & Schimp. var. xanthopus, Kindb. N. var.

Leaves less chlorophyllous than the type, costa virescent. Capsule larger; teeth more united; pedicel yellow.—On the the banks of Boggy Creek, Manitoba, where the "Carleton trail" crossed it (August 10th, 1872.) John Macoun, Coll.

Encalypta rhabdocarpa, Schwæger. var. leiomitra, Kindb. N. v.

Calyptra smooth; peristomial teeth blunt; spores larger, about 0.05 mm.; costa vanishing at the apex of the leaves.—On rocks along the Clearwater River, Athabasca, Lat. 57° (July 11th, 1888.) J. M. Macoun, Coll.

Physcomitrium strangulatum, Kindb. N. sp.

Differs from *P. pyriforme* in the leaves being shorter, obovate-lingulate, more or less acuminate, often serrate below the middle; costa longer, subpercurrent; capsule (unripe) larger, constricted under the orifice; calyptra longer; lid without a beak; pedicel flexuous or curved. —In a ditch, Port Dover, Ont. John Dearness, Coll.

Webera fontana, Kindb. N. sp.

Allied to *W. albicans*, but quite green, leaves not decurrent, more denticulate, at least to the middle. Barren.—In wet springy places at Canaan Forks, Queen's Co., New Brunswick (November, 1889). J. Moser, Coll.

Bryum pendulum, Schimp. × cylindricum, Kindb. N. Subsp.

Capsule narrow, cylindric-oblong; lid deplanate; spores small, scarcely 0.22 mm. long; flowers diœcious; stem-leaves ovate; costa red, short-excurrent.—On wet rocks, Kananaskis Falls, Rocky Mountains (June 23rd, 1885). J. Macoun, Coll.

Thelia compacta, Kindb N. sp.

Stems closely creeping. Tufts green, very dense and thick. Branches erect, terete, obtuse and unilateral. Leaves cochleariform, rotundate-obtuse and short-apiculate, very scabrous at the back, with simple incurved papilliferous ciliæ; borders spinulose-dentate or fimbriate-ciliate; ciliæ long, curved up and dentate; costa obsolete or very short. Perichetial leaves oblong-lanceolate, narrowly-acuminate, fimbriate. Capsule pale-brown, ovate-cylindrical; teeth subulate, short and broad, horizontally divaricate when moist, distantly articulate, dusky, the top article cleft; basilar membrane short, scarcely ¼ the length of the teeth, without segments; operculum conic obtuse, not curved, ⅓ the length of the capsule; pedicel smooth scarcely 1 cm. long. Differs from *Thelia hirtella* in the longer branches, the larger and more pellucid leaves, the greater leaf-cells and the longer, thicker capsule, also in the peristome. —Abundant on the stems of young maples in the central counties of Ontario. Fruiting abundantly in Seymour, Northumberland Co., and forming thick girdles about four feet from the ground. John Macoun, Coll.

Leskea nervosa, Myrin, var flagellifera, Kindb, N. var.

Stem furnished with numerous flagelliform branchlets ; leaves small.—On trees in McKay's woods near Ottawa (Oct. 24th, 1885). J. Macoun, Coll.

Thudium lignicola, Kindb. N. sp.

Monœcious. Tufts yellowish or bright green. Stems simply pinnate with few rhizoids and short, scarcely ramose, paraphyllia ; branches close, distichous, attenuate, flexuous or slightly recurved. Stem-leaves from the broad cordate base attenuate to a long, often curved, point, faintly striate, reflexed on the borders ; branch-leaves shorter, acuminate ; all denticulate from the middle upward and papillose at the back or on both sides ; cells obscure and rounded ; costa vanishing in or below the apex. Capsule cylindical, arcuate and light brown ; teeth pale ; ciliæ long, perfect ; annulus double ; lid conical. Differs from *T. Blandovii* in the shorter areolations of the leaf-cells, the smaller capsule and the shorter paraphyllia.—On rotten logs along the base of the Porcupine Mountains, Manitoba (July 29th, 1881). John Macoun, Coll.

Cylindrothecium cladorrhizans (Hedw) Sulliv. Non Schimp.

This species differs from the European *Cylindrothecium Schleicheri* Bruch, & Schimp, principally in the easily detached annulus of the capsule (Demeter Revue Bryol, 1885, No. 6).—On rotten logs and on stones and roots of trees in woods ; Ontario. Common at Ottawa.

Brachythecium rivulare, Bruch Ms. × Novæ-Brunsviciæ, Kindb. N. Subsp.

Stem irregularly divided ; branches simple and elongate. Leaves glossy, ovate, blunt or short-acute, striate, decurrent, indistinctly denticulate above or from the middle ; cells dilatate, principally the lower and the uppermost, the alar and basilar finally orange-reddish, the alar rarely greater ; costa short and simple.—On a horse trough at Canaan Forks, Queen's Co., New Brunswick (October, 1889). J. Moser, Coll.

Brachythecium cyrtophyllum, Kindb. N. sp.

Habit of a small form of *B. albicans.* Plants cæspitose, green and faintly glossy. Stems irregularly divided, not creeping ; branchlets filiform sub-obtuse. Leaves small, close, loosely appressed when dry, open-erect when moistened, ovate-acute or short acuminate, not sulcate or decurrent, serrulate at least above the middle; borders recurved below the middle; areolation loose; upper cells narrowly rhomboidal, inner sublinear; alar quadrate somewhat numerous, chlorophyllose; costa stout reaching to ⅔. Perigonial leaves ecostate. Diœcious.—On elm logs in thick woods, Brighton, Northumberland Co., Ontario (October 6th, 1888). J. Macoun, Coll.

Isothecium (?) Dawsoni, Kindb. N. sp.

Tufts soft, bright green, intricate. Stems slender, filiform, irregularly branching, sparingly radiculose; branchlets short, flexuous or incurved. Leaves small, spreading, loose or not crowded, ovate-oblong, cuspidate or filiform-acuminate, at the base slightly reflexed on the borders, denticulate above, pellucid but sometimes faintly papillose; most of the cells narrow-lanceolate, the basal and marginal quadrate-oblong; costa none or very short and simple. Capsule oblong, pale brown, not striate; lid obliquely short beaked; annulus large, pedicel smooth, bright red-yellow, ⅕ cm. long. Diœcious. Habit of *Pylaisia velutina.*—On the base of trees in woods, Jupiter River, Anticosti (August 26th, 1883). J. Macoun, Coll.

Rhyncostegium (?) aneuron, Kindb. N. sp.

Tufts dense, green and glossy. Leaves distichous, crowded and patent, flat, ovate-oblong, acute or short-acuminate, estriate, entire or denticulate above the middle, decurrent; cells very long and narrow, the alar large, hyaline and subquadrate; costa none or obsolete. Capsule cylindric-obovate, horizontally curved; teeth yellow; pedicel smooth, 2 cm. long; lid unknown. Probably diœcious.—This species could possibly be referred to *Plagiothecium.* On dead wood in Dow's Swamp, near Ottawa (October 17th, 1884). J. Macoun, Coll.

Amblystegium speciophyllum, Kindb. N. sp.

Plants loosely cæspitose, dark green. Stems capillary, irregularly ramulose, not or sparingly radiculose. Leaves small, long-distant, spreading, subcordate or oval oblong, blunt or sub-acute, entire or denticulate; cells short; costa sub-percurrent, broad, sometimes very distinct, Barren. Probably diœcious. Habit of *Amblystegium Sprucei.* On rocks at Canaan Forks, Queen's Co., New Brunswick (November, 1879). J. Moser, Coll.

Amblystegium tenuifolium, Kindb. N. sp.

Plants loosely coherent, green; stems capillary, irregularly ramulose. Leaves small, far apart, spreading, very narrow, ovate-lanceolate acute, often denticulate; cells dilated but elongate; costa more or less distinct. Barren. Habit of *Amblystegium Sprucei.*—On the borders of a pond near London, Ont. (June, 1889). John Dearness, Coll.

Hypnum (Harpidium) Moseri, Kindb. N. sp.

Differing from *H. uncinatum* in the leaves not being striate, but sometimes recurved at the base; costa faint, often failing; differing from all other *Harpidia* in the stem being densely radiculose.—On the base and trunks of poplar trees in woods at Canaan Forks, Queen's Co., New Brunswick (December 30th, 1889). J. Moser, Coll.

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REPORT OF THE ORNITHOLOGICAL BRANCH FOR THE YEAR 1889.

To the Council of the Ottawa Field-Naturalists' Club:

GENTLEMEN,—The leaders of the Ornithological Branch have the honour to report that during the year 1889 two additions were made to the list of Ottawa birds, viz.: *Falco peregrinus anatum* (Bonap.), Duck Hawk, mentioned in the Spring report published 1st August, and *Somateria dresseri* (Sharpe), American Eider. A young male of this species, in the plumage of the female, is reported by Mr. G. R. White as having been shot by him on the Ottawa River a short distance below the city on 9th November. Another specimen (a male in mature plumage) said to have been shot on the Gatineau river, was bought on the By-Ward market, and is now in the museum of the Geological Survey. In this connection it is interesting to note the capture at Toronto, November 25th, of a male of the King Eider (*S. spectabilis*, Linn.), the first positive record for Ontario. A Cardinal Grosbeak

(*Cardinalis cardinalis*, Linn) was observed several times during the spring of 1888 by Mr. H. B. Small and others in a garden on Wilbrod Street, but was not reported to the leaders at the time. It has not been deemed advisable to add this species to the list in the face of the possibility that it may have been an escaped cage bird.

The Field Sparrow (*Spizella pusilla*) was observed in two different localities in 1889, and remained during the Summer, but in neither case was the female seen, nor was the nest discovered. On 13th July Mr. R. B. Whyte found a Sora Rail (*Porzana carolina*) dead in his garden, bearing marks of having met its death by flying against some object, probably at night. A Hudsonian Chickadee (*Parus hudsonicus*) was seen on 20th October, an unusually early date for the species.

Notes of the supposed observation of *Geothlypis agilis* and *Turdus aliciæ* were inserted in the report for the year 1888 (Vol. II. p. 150). Neither of these has been confirmed, and for the present, at least, they are dropped from the list. Appended are lists of the departures of summer birds and the arrivals of winter ones.

Summer birds last seen :—

July 7.—*Seiurus aurocapillus*, Ovenbird.
8.—*Geothlypis philadelphia*, Mourning Warbler.
20.—*Habia ludoviciana*, Rose-breasted Grosbeak.
21.—*Dolichonyx oryzivorus*, Bobolink.
28.—*Spizella pusilla*, Field Sparrow.
Aug. 3.—*Contopus borealis*, Olive-sided Flycatcher.
6.—*Melospiza georgiana*, Swamp Sparrow.
8.—*Dendroica pennsylvanica*, Chestnut-sided Warbler.
8.—*Sylvania canadensis*, Canadian Warbler.
8.—*Passerina cyanea*, Indigo Bunting.
10.—*Tachycineta bicolor*, Tree Swallow.
11.—*Totanus solitarius*, Solitary Sandpiper.
11.—*Molothrus ater*, Cowbird.
25.—*Sturnella magna*, Meadowlark.
25.—*Chelidon erythrogaster*, Barn Swallow.
25.—*Icterus galbula*, Baltimore Oriole.
25.—*Coccyzus erythrophthalmus*, Black-billed Cuckoo.

Aug. 28.—*Progne subis*, Purple Martin.
Sept. 1.—*Agelaius phœniceus*, Red-winged Blackbird.
1.—*Myiarchus crinitus*, Crested Flycatcher.
1.—*Setophaga ruticilla*, American Redstart.
1.—*Petrochelidon lunifrons*, Cliff Swallow.
1.—*Trochilus colubris*, Ruby-throated Hummingbird.
1.—*Helminthophila ruficapilla*, Nashville Warbler.
2.—*Chætura pelagica*, Chimney Swift.
2.—*Tyrannus tyrannus*, Kingbird.
8.—*Clivicola riparia*, Bank Swallow.
8.—*Vireo olivaceus*, Red-eyed Vireo.
14.—*Vireo gilvus*, Warbling Vireo.
15.—*Dendroica blackburniæ*, Blackburnian Warbler.
15.—*Sphyrapicus varius*, Yellow-bellied Sapsucker.
15.—*Pandion haliaëtus carolinensis*, American Osprey.
15.—*Mniotilta varia*, Black and White Warbler.
15.—*Actitis macularia*, Spotted Sandpiper.
15.—*Dendroica maculosa*, Magnolia Warbler.
15.—*Dendroica virens*, Black-throated Green Warbler.
15.—*Seiurus noveboracensis*, Water Thrush.
17.—*Poocœtes gramineus*, Vesper Sparrow.
22.—*Carpodacus purpureus*, Purple Finch.
22.—*Geothlypis trichas*, Maryland Yellowthroat.
22.—*Ampelis cedrorum*, Cedar Waxwing.
23.—*Empidonax minimus*, Least Flycatcher.
24.—*Chordeiles virginianus*, Night Hawk.
25.—*Melanerpes erythrocephalus*, Red-headed Woodpecker.
25.—*Colaptes auratus*, Flicker.
25.—*Urinator imber*, Loon.
26.—*Buteo latissimus*, Broad-winged Hawk.
28.—*Vireo solitarius*, Blue-headed Vireo.
28.—*Sayornis phœbe*, Phœbe.
28.—*Dendroica æstiva*, Yellow Warbler.
28.—*Anas obscura*, Black Duck.
28.—*Anas boschas*, Mallard.
28.—*Aix sponsa*, Wood Duck.

Sept. 28.—*Anas carolinensis*, Green-winged Teal.
29.—*Spizella socialis*, Chipping Sparrow.
29.—*Podilymbus podiceps*, Pied-billed Grebe.
29.—*Contopus virens*, Wood Peewee.
29.—*Certhia familiaris americana*, Brown Creeper.
30.—*Turdus fuscescens*, Wilson's Thrush.
30.—*Cistothorus palustris*, Long-billed Marsh Wren.
30.—*Fulica americana*, American Coot.
Oct. 2.—*Ardea herodias*, Great Blue Heron.
2.—*Botaurus lentiginosus*, American Bittern.
3.—*Quiscalus quiscula æneus*, Bronzed Grackle.
3.—*Galeoscoptes carolinensis*, Catbird.
5.—*Dendroica coronata*, Myrtle Warbler.
6.—*Ammodramus sandwichensis savanna*, Savanna Sparrow.
9.—*Troglodytes aëdon*, House Wren.
10.—*Zonotrichia leucophrys*, White-crowned Sparrow.
13.—*Scolecophagus carolinus*, Rusty Blackbird.
13.—*Gallinago delicata*, Wilson's Snipe.
13.—*Ceryle alcyon*, Belted Kingfisher.
14.—*Sialia sialis*, Bluebird.
16.—*Falco sparverius*, American Sparrow Hawk.
17.—*Circus hudsonius*, Marsh Hawk.
17.—*Otocoris alpestris praticola*, Prairie Horned Lark.
19.—*Totanus melanoleucus*, Greater Yellow-legs.
20.—*Passerella iliaca*, Fox Sparrow.
20.—*Zonotrichia albicollis*, White-throated Sparrow.
22.—*Merula migratoria*, American Robin.
24.—*Spinus tristis*, American Goldfinch.
27.—*Regulus calendula*, Ruby-crowned Kinglet.
28.—*Melospiza fasciata*, Song Sparrow.
29.—*Troglodytes hiemalis*, Winter Wren.
29.—*Spizella monticola*, Tree Sparrow.
Nov. 1.—*Branta canadensis*, Canada Goose.
1.—*Anthus pennsylvanicus*, American Pipit.
1.—*Sitta canadensis*, Red-breasted Nuthatch.
1.—*Glaucionetta clangula americana*, American Golden-eye.

Nov. 3.—*Regulus satrapa,* Golden-crowned Kinglet.
4.—*Junco hiemalis,* Slate-coloured Junco.

Winter birds first seen :—

Oct. 19.—*Acanthis linaria,* Redpoll.
20.—*Parus hudsonicus,* Hudsonian Chickadee.
29.—*Lanius borealis,* Northern Shrike.
Nov. 1.—*Plectrophenax nivalis,* Snowflake.
Dec. 22.—*Pinicola enucleator,* Pine Grosbeak.

WM. A. D. LEES,
JOHN MACOUN, } *Leaders.*

OTTAWA, 14th March, 1890.

During the discussion which followed the reading of the above report, Prof. Macoun questioned the accuracy of the results obtained by Mr. Lees's system of observation with an opera glass, and asked for a detailed explanation of the system. Mr. Lees explained that, having first acquired from a study of the commoner birds a fair knowledge of the characters distinguishing the families or higher groups, each new species met, having been first assigned to its appropriate family or group, was carefully scrutinized with the aid of the glass, and its markings literally read off and compared with one after another of the descriptions in the text book, till one was found to correspond with it. In this way the list of unidentified species in each family was gradually narrowed down till it became comparatively easy to hit upon the proper description at once. In many cases the bird had to be carefully stalked and followed for some time, and in some it was not until it had been seen on several different occasions that it was finally and satisfactorily identified, the greatest care being taken to avoid mistakes. Besides the text-book, recourse was also had to the colored plates in De Kay's "Natural History of New York," and to the mounted specimens in the Geological Survey Museum. He also pointed out that two persons working together, as he and Mr. N. F. Ballantyne had done, could give mutual assistance of great value, one holding the glass and the other the book. Mr. Kingston, who also observes with a glass, stated that instead of taking a text-book to the field he noted in a small book kept for the purpose, the size and markings of each bird, following the same order in every case, and compared the descriptions with those in the books afterwards. On these explanations being given, Prof. Macoun expressed himself satisfied that, with proper care, there was no reason why these systems or either of them should not lead to accurate results. He also said that for amateur ornithologists they were much to be preferred to the system of shooting, so often followed to excess and without discrimination.

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REPORT OF THE GEOLOGICAL BRANCH.

(Read March 14th, 1890.)

To the Council of the Ottawa Field-Naturalists' Club:

Gentlemen:—In presenting to you the summary Report of the Geological Branch of the club's work for the year 1889 to 1890, the leaders desire to announce that continued interest in this line of enquiry is still manifest amongst many of our members. It would be very strange indeed if it were otherwise, seeing that the district in which we live is replete with interest on every side to the student of Geology. The field of our observations has been only run over, and whilst considerable work and good results have been obtained and wrought by members of our Club, yet, the region offers inducements on every hand. Whether we have to deal with one or other of the three great systems of rock-formations in this district, viz., the Laurentian or Archæan, the Palæozoic, the Post-Tertiary, each one offers enough material to be worked out and new facts to be developed and systematized for years to come.

I. In the Laurentian rocks of the Ottawa district, the mode of occurrence, distribution and genetic history of the crystalline limestones, of the iron ores, the phosphate deposits and the relations of these to the areas of intrusive granites, pegmatites and gneisses and numerous dykes of diabase, diorite and other constituents togethe with the occurrence of the ophites, serpentines, jaspers, graphite, mica galena and other minerals and rocks (characterizing that period of time in the history of the earths' crust in our locality) are all questions which naturally present themselves for study, furnishing abundant material for investigations in mineralogy and petrographical science of the highest type.

The vast amount of mineral wealth which the Ottawa region affords is known to be such as to predicate a bright future for mining operations at our very doors. The Buckingham, Bristol, Templeton and Hull mines of iron, apatite, mica, &c., are still in their infancy, new, rich and valuable deposits are found almost weekly by experts, so that this region bids fair soon to become a very extensive and important mining centre.

II. In the Cambro-Silurian or Ordovician deposits at Ottawa we find a continuous sequence of sedimentary rocks from the Potsdam formation through the Calciferous, Chazy, Bird's Eye and Black River, Trenton and Utica to the Hudson River formation with the possible occurrence of the basal beds of Silurian rocks east of the city.

Up to the present time these various formations have afforded a great deal of fine material and fossil remains teem throughout the various measures to such an extent that nearly every outcrop may be said to be fossiliferous from the bottom to the top.

At the sub-excursions held during the past collecting season, new material was found, and it is the experience of every collector in the Ottawa district that each days' systematic search in any formation will afford new and interesting discoveries. Some of our formations like the Trenton and Utica have been fairly well examined, but more detailed and systematic work is what is now required in all of them.

III. In the field of Post-Tertiary or Surface Geology there remains much to be done. The evidences and phenomena characterizing the glacial epoch are so numerous, varied and replete with interest owing to the peculiar orographic features of this region on the border line of the great Archæan nucleus and plateau that there can scarcely be said to be a more inviting field of research anywhere in Canada. Mr. Ami has continued his investigation into the history of these various deposits, and has been able to collect additional material during the past season of considerable interest and value In the history of the more recent overlying marine clays and subsequent sands, ancient beaches, river channels, gravels and estuarine deposits as well as in the marl deposits of this region he has also collected a large amount of valuable data.

With a view to bring before the members of our Club and palæontoloists generally as well as geologists, each work bearing on Canadian geology and palæontology as soon as published, one of your leaders has undertaken the task to review the same and note them in the OTTAWA NATURALIST.

To accompany the description of a new *Turrilepas,* viz., T. Canadensis, Woodward—which had been sent to the author for determination—Mr. Ami wrote a stratigraphical note and added a section, all of which were published in the July number of the Geological Magazine, London, England, for 1889.

Quite a number of obscure forms of graptoloidea were discovered in beds of Lower Trenton age at Hull. These, along with another series from Lewis' sHill and Concession Street form an interesting group of Trenton Graptolites which it is hoped soon to supplement with better material and study.

Two additional specimens of *Brachiospongia diqitata,* Owen, were discovered in Hull, also specimens of *Lichas Trentonensis,* Conrad, in the Trenton quarries, Hull, Que.

At the sub-excursions held during the past season quite a number of members of the Club availed themselves of the opportunities afforded of examining the geological features of this region and obtained considerable information and some interesting specimens.

With regard to the attempt made by a local company to sink a drill-hole for "natural gas, petroleum, salt or any other kind of mineral or substance that can be utilized."—to quote the words of one member of the company—they were made aware that the hole was being drilled at a point which would not give the locality a fair test by any means, and that moreover the most bituminous rocks and formations known in the district were absent at that point—between Bank and Percy street south, and near to the Canada Atlantic Railway line. The great improbability then stated has only been corroborated by the evidence obtained in the work and the "Table showing the Rock-Formations of the district" by Mr. H. M. Ami* in their natural order has been thoroughly confirmed by the drillings obtained at the works. Many of these were examined by Mr. Ami and their evidence was quite conclusive.

Special examinations were made of the Post-Tertiary formations at Poupore's Quarry, Hull, and a valuable series of photographs taken by Messrs. H. N. Topley, Mr. McConnell and Mr. Low, in company with Mr. Ami. These illustrate very well the mode of occurrence and distribution of these deposits at the locality in question.

Whilst the excursions afford information to a larger number of members of the Club—it is manifest that only when work is of a more individual, close and systematic nature does it result in being of a more useful kind. Small working parties are found to be of incalculable value in obtaining reliable information and carrying on original work in any district.

In conclusion, your leaders hope that the interest manifest in Geological work by the members of our Club may continue, and the whole is respectfully submitted.

H. M. Ami,
A. P. Low,
Leaders.

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EXCURSION No. 3.

Members will please take notice that the next General Excursion of the Club will be held on Saturday the 19th July. The place chosen is Montebello, a thriving village, charmingly situated on the North bank of the Ottawa River, about 40 miles from the city. It is noted for its surrounding forests, mountains and numerous cold water brooks and springs, and near it is the fine mansion of the Papineau family. The Steamer *Empress* will leave the Queen's Wharf at 7:30 A. M. and return at about 7 P. M. The following rates will be charged: Adults, 50c.; Children over 6 and under 12 years, 25c. The locality is rich in minerals and of much general interest to geologists, while the fauna and flora are abundant and of an exceedingly varied character.

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*The Ottawa Naturalist, Vol. II., No. 6, p. 96.

THE WOLF (CANIS LUPUS).

By William Pittman Lett.

The present, according to the Ontario Game Act, is what is known to sportsmen as the "close season," that *pax vobiscum* interval, during the continuance of which the wild birds and wild animals of the forests, the rivers and the lakes are supposed to be allowed to rest in undisturbed tranquility, unawed by the presence of man, unstartled by the deadly reverberations of the rifle or the shotgun.

Next to the matchless and magnificent surroundings of a happy sojourn in a tent, in the lonely and beautiful solitudes of the wilderness—next to a successful hunt with congenial companions, skilled in the mysteries of wood and water craft—may be classed the enjoyment of telling your experience, what you know, what you have learned, amid the solemn, sublime and illimitable glories of nature. The pleasureof the situation is enhanced, when the detonating story of the camp fire is told to kindred spirits, to sportsmen, to naturalists, to reading and thinking men, who are certain to appreciate the attractions of the narrative if it has any, sure to comprehend all, and perhaps much more than you are able to tell them.

I need scarcely say that I am delighted to find myself standing once more before the Field-Naturalists' Club of the City of Ottawa. Perhaps I have said as much before. Very likely I have. "Out of the fulness of the heart the mouth speaketh." In whatever I attempt I am ever and always an enthusiast. If I place myself in a lowly rank in that frequently misjudged and misunderstood band, nevertheless, under the light of history, I come to the conclusion that at appointed times—in favourable crises—enthusiasts have been the men who in various eras in the past, have created religious, moral, social, political and scientific earthquakes in the world. I have accidently stumbled upon an interesting and practically inexhaustible subject. I can't pursue it now. I just leave it, by simply saying, that in my opinion, one hour of enthusiastic energy in any cause, is worth a whole year of cold, calculating induction. Enthusiasm is the electricity of intellect, it is the sweeping flame of earnest endeavour. It is the strong, soaring wing of the spirit which carries the votary of truth above the mountain top, and enables him to get a nearer view of the stars.

Every man is an enthusiast, whose prophetic eye can see through the mist—who, gifted with a prescinct insight into the abstruse problems, obstacles and contingencies of his day, takes off his coat, rolls up his sleeves, and cries, come on! to difficulties in the glorious warfare for human liberty, human progress, material development and scientific investigation.

NOW FOR THE WOLF.

Hark to that minstrelsy, ringing and clear!
'Tis the chorus of death on the trail of the deer;
The fierce forest bloodhounds are gathering in might,
Their echoing yells wake the silence of night,
As relentless they stretch over mountain and plain,
The blood of their fast speeding victim to drain;
They close—he stands proudly one moment at bay—
'Tis his last—they are on him, to ravage and slay!

The wolf belongs to the genus *Lupus*, or the canine family. According to "Audubon and Bachman's Quadrupeds of North America," the wolf has six incisors in the upper and six in the lower jaw ; one canine tooth in each jaw, and six molars above and six below.

GENERIC CHARACTER OF THE WOLF.

The three first teeth in the upper jaw, and the four in the lower jaw are trenchant, but small, and are also called false molars. The great carnivorous tooth above is bicuspid, with a small tubercle on the inner side; that below has the posterior lobe altogether tubercular. There are two tuberculous teeth behind each of the great carnivorous teeth. The muzzle of the wolf is elongate, tongue soft, ears erect, but sometimes pendulous in the domestic varieties. The fore feet are pentedactylous, or five toed, the hind feet tetradactylous, or four toed. The teats are both inguinal and ventral.

The grey wolf of Canada—the typical large wolf of North America —is about five feet six inches in length from the point of the nose to extreme end of the tail; ordinarily twenty-six inches high at the shoulder; larger ones, however, measuring twenty-eight inches and upwards in height, and they weigh from eighty to one hundred pounds when in good condition.

I give the latter measurements and weight from the bodies of wolves which I have killed, and I am confident that I am rather under than over the actual size and weight of the American wolf.

There are several varieties of American wolves, differing so much from each other, chiefly in colour, as to lead naturalists to the conclusion that they are different in species, and do not originate from the same primeval stock. They are all about the same size, and when they chance to meet, band together in the same pack.

In size and other distinctive peculiarities, the larger wolves differ from the prairie wolf and the coyote. Both of these smaller varieties burrow in the ground; are much less savage or destructive, and much more docile and affectionate in a state of domestication; and also, much more easily tamed than are those of any variety of the larger species.

According to the best zoological authorities, all the varieties of the larger species of wolves are dwellers upon the surface of the earth, sleeping in the open air, or making their dens in caves or crevices of rocks.

The most valuable skins are obtained from the white arctic wolf. The next in thickness of fur and costliness, is thé skin of the grey wolf of North America, and so on down to the pelt of the black wolf, which being a southern animal, ranging in a warmer habitat, carries the coarsest and thinnest coat of the entire genus, and his skin consequently is of the least value.

The grey wolf, the variety most common in Canada, bears a striking resemblance to the European wolf. There are, however, differences between them, which appeared at one time to be distinct and permanent. Naturalists of later years seem to be unanimous in the conclusion that the wolves of the old and the new world belong to one species.

The American wolf, notably the Canadian variety, is at least equal in size to that of any other country.

Billings tells us, that the body of the American wolf is long and gaunt, muzzle elongate and somewhat thicker than that of the Pyrenean wolf, head thick, nose long, ears erect and conical, eyes oblique, as is the case with all true wolves; pupil of the eye, circular, tail straight and bushy. The animal does not carry it curled over his back like a dog."

To this correct and excellent description I may add that the eye of the North American wolf is of a greenish colour; its expression is sneaking and sinister, intermingled with an aspect of extreme cunning similar to, but far surpassing in force that of the yellow eye of the fox. As stated above, the tail of the wolf is bushy, but corresponding with the size of the animal it is neither so long, nor so elegantly rounded and heavy as that of the fox.

At one time the grey wolf was found all over the American continent, as far south even as the Gulf of Mexico. It is still to be met with in considerable numbers on the great plains of the west, in the northern and western States, on the slopes of the Rocky Mountains, and in more or less abundance, according to favorable location, in all the remote or sparsely settled portions of Canada, New Brunswick, Newfoundland and Cape Breton.

As before remarked, the black, red and grey, as well as the white wolves of the arctic regions are believed by scientific naturalists to belong to one and the same species. In physical conformation, size, weight and general character they are specifically identical. The difference of colour alone, attributable to the influences of diversity of climate, appears to be the only distinguishing feature between one variety and another. In voice, form, and manner of hunting their prey, all the varieties of the North American wolf are essentially similar.

In early times in Canada, and in the valley of the Ottawa, not less than in other places, wolves were dangerously abundant. In all new settlements, sheep, when a farmer was fortunate enough to possess any, had to be carefully penned up every night, otherwise wool would certainly have been found flying before morning.

It was not alone that in one of those nocturnal raids many sheep were devoured. This was not the worst feature in the transaction. A couple of these bloodthirsty marauders, in a single night, would kill fifteen or twenty sheep, simply tearing their throats for the purpose of sucking the blood, without otherwise mutilating the carcasses.

After such a catastrophe cheap mutton was easily procurable; frequently too at a season of the year when the old pioneers were obliged to live without meat of any kind, fresh or salt, for months at a stretch. For the benefit of those who may be unacquainted with the hardships and privations endured by the enterprising men who with axe and handspike opened up the blooming glades of civilization in our ancient forests, I may say that this enforced economical fast usually did not terminate until the pigs were killed in December.

My subject this evening is the wolf. Let me call him, *pro tempore*, to suit the occasion, *Lupus Canadensis*, as I shall deal chiefly with the wolf of the Ottawa Valley, perhaps as large, as fierce, as cunning, and as sanguinary an animal of the amiable family to which he belongs, as can be found in any part of the world.

Apart from the information which I have gathered from the authentic records of natural history, I have had a somewhat intimate acquaintance of a personal nature with this voracious bandit of the wilderness— an acquaintance based upon practical observation, supplemented by the agency of steel traps.

It is a commonly received opinion that the fox surpasses all other animals in cunning. I have had what I consider good and sufficient reasons for doubting the correctness of this conclusion. I do not like to disturb an old popular belief, nevertheless I think that anyone who tries to catch a wolf in a steel trap, will agree with me in the fact, that the wolf is a much more cunning animal than the fox.

In my younger days, I trapped many foxes and wolves, as well as fishers, minks and muskrats. I used no pungent oils, or other extraneous attractions to wile them, but simply matched my own intelligence against their cunning, and in the case of the wolf, I have often for many successive days, found myself completely circumvented.

In proof of the persistent cnnning of the wolf, I may relate a circumstance which bears directly upon the point. While out trapping in the month of November, 1840, I fastened a piece of liver upon the knotty spike of a hemlock tree, about three feet from the ground, and set a well concealed trap under it. The wolves frequented the spot every night, and although they trampled a circle in the snow about six feet from the tree, or twelve feet in diameter, their dread of the trap prevented their touching the meat, notwithstanding the fact that it remained in its original position until the first day of April.

A short distance from the same spot, during the same year, I caught three wolves, twenty-seven foxes, three fishers and a marten. I had more real difficulty in capturing the three wolves than I experienced in catching all the others.

I captured the wolves in the following manner. I deposited a quantity of pigs' livers and other offal in the centre of a dense cedar swamp, near the present site of the Carp village, in the Township of Huntly. I had heard wolves howling there after deer on several occasions previously, and I was aware that they had killed a number of sheep and a few young cattle in the neighborhood. The wolves soon scented the bait, and gathered around it. I frequently had the pleasure of listening to their inimitable music in the vicinity of the bait. I visited the spot about three times in each week, always stepping carefully in the same tracks, going to and returning from the bait. I found that during the first three weeks they had not ventured closer than within six or eight feet of the bait, although the snow was beaten down by their tracks all around it.

Early in the fourth week I found that they had devoured the greater part of the bait. The hour for action had arrived. I then renewed the bait, and set a trap in front of it, where they had again commenced eating. After the trap was set I was particular in leaving the snow and the surroundings exactly as I found them. Next morning I found the springs of the trap bare; the snow had been scraped away and the bait eaten on the other side. I then set another trap on the opposite side, and next morning found the snow and covering scratched away from both traps. I was somewhat puzzled, but determined to persevere. I then set both traps in such a manner, that, should the wolves attempt the scratching trick again, the first part of the traps that could possibly be touched would be the pan. The wolves came that night, and one of them remained there; for, to my great satisfaction, I found him fast in one of the traps in the morning. He was a fine, large specimen, twenty-eight inches high at the shoulder, correspondingly long and bulky, and weighing at least eighty pounds.

As it has fortunately turned out for the purposes of this paper, I subjected *Mr. Lupus* to a critical examination. I stirred him up smartly, and experimented upon him, with the view of practically learning something which I did not then know about the members of his interesting race. I endeavoured to make him give tongue, but all my efforts proved fruitless. I could not induce him to utter a single sound, nor did he attempt to snarl or growl even under strong provocation. I noticed that whenever I stepped off a few paces, at each step he raised his body until he stood at his full height. At each step as I approached him again, he lowered himself until he lay flat on the ground with his head between his paws, in which position he remained as long as I stood beside him. He seemed exceedingly shy and timorous; but he was far too cunning to display any ferocity.

An otter, a fisher, a lynx or a marten would have growled, snarled and fought viciously under similar conditions.

I feel convinced that with a collar and chain, I could have led him home without difficulty. I put this opinion to the test, in the following manner. For the purpose of fastening the trap, I had cut down a balsam sapling about two inches in diameter, the root end of which I cut off square, into which I drove a staple. To this staple I locked the trap chain with a small padlock. I then replanted the tree exactly in the spot where it had grown, and where the wolves had been in the habit of seeing it night after night for weeks.

When I had completed my zoological experiments—never then expecting to tell you anything about them—I unlocked the chain and started towards home. The wolf arose and followed me quietly for about a quarter of a mile, when I accidently tripped over a pine root and fell. Had I not known something about the history and character of my companion, there might have been, then and there, a tragedy of peculiar interest. The instant I fell, and before I attempted to rise, I turned my head quickly and looked my prisoner in the eye. I found him with his eyes flashing and his whole body gathered for a spring. The moment I caught his eye he cowered before my gaze. Had I not been prompt, it is quite within the bounds of possibility that my audience might not have heard my story. However, I was young, strong and active then, and you may rest assured that I could not have been silenced without a determined and sanguinary struggle.

Long before the occurrence of the incident just related, I had learned that it was dangerons to fall even in the presence of a domesticated wolf.

I need scarcely say that I did not trouble my amiable companion.

to follow me any farther, but with one blow of a heavy stick which I carried for the purpose, I laid him out, as doubtless in his time he had laid out many a beautiful deer preparatory to devouring him.

The three wolves I had killed formed part of a pack which had, a few weeks before their tragical departure for "the happy hunting grounds," committed serious depredations. I put the succeeding two, each of which was equal in size to the first, through a like process of investigation, but failed to elicit anything new.

I had frequently heard the pack in full cry at night. Had it been close at hand, the sound might have proved terrifying to persons not gifted with an ear capable of appreciating nature's majestic harmonies. To me, however, the nocturnal chorus of those wolves, seemed the clearest and most melodious musical effort I had ever listened to. Since then I have heard wolves frequently, but nothing in their tones has caused me to change my opinion.

The Madawaska River, so far as unrivalled natural beauty could make it so, was once the foaming Queen of the Ottawa's magnificent tributaries—has along its turbulent course many rapids and chutes of marvellous grandeur and beauty. One of these chutes, situated about one hundred miles from Ottawa, is called "Wolf Portage." It was so named on account of deer being chased by wolves into the constantly open water at that point. In winter time the hunted deer were in the habit of plunging into the rapids to escape the fangs of their sanguinary pursuers. In catching their prey at the foot of the portage the wolves displayed much cunning. When a deer took the water at the head of the chute, it was quickly carried over the rough rapid into the gradually narrowing ice-enclosed glade or channel at the foot. Just at the spot where the current drove it against the ice, under which it would immediately be whirled, a number of wolves stood on the ice, and the instant the deer touched its edge, it was seized, dragged out on the ice and devoured.

On the Madawaska River, in the early lumbering times, the skeletons of wolves could always be seen in winter lying on the ice at the foot of the Wolf Portage.

So numerous were the wolves in the woods on the Madawaska, that during the years 1840 and 1841, the deer were driven completely out of the section of country lying between the High Falls and the Keminiskeek Lake, a distance of sixty miles in length, and ten miles from each side of the river. The deer began gradually to reappear there in 1844, and when they returned to their old haunts along "The Hidden River," the wolves followed them to their ancient habitat. For many years deer have been abundant in the Madawaska region.

The old "Stony Swamp," west of Bell's Corners on the Richmond Road, was at one time, much infested by wolves, on account of its having been a famous fastness for deer. The wolves of that section did considerable damage to the flocks of farmers in the neighborhood.

In connection with this well known old road, I remember an incident which took place in the year 1830. It may not be known to everyone that at that early period in the history of the County of Carleton, oxen were chiefly used for all purposes of draught and travel by the farmers of that day, simply because they had no horses. Farm produce was then drawn to Bytown Market on ox sleighs, and then, as now, the journey to the market was performed partly in the night.

One clear moonlight night a farmer from the westerly part of the Township of Nepean, was driving his oxen through the lonely windings of the road in the Stony Swamp. The season was winter. He had a small dog with him which was running along a short distance in front of the team. Suddenly he heard a piteous howl, and on looking in the direction of the sound, he saw an enormous wolf darting away through the trees with the struggling dog in his mouth.

During the first few years of the early settlement of Hull, wolves were very numerous and destructive in that neighborhood. They had killed many sheep, and had also very much disturbed the minds of timid people. Something decisive had to be done to abate the nuisance. A hunter set a trap and succeeded in catching one of the offenders. He skinned part of his head and sides, and fastened a broad red collar, to which was attached a bell, around his neck. The rather cruelly treated wolf was then liberated, and according to the story, wolves became scarce in the neighborhood of Hull for a number of years.

In the year 1839, in the beautiful month of October, when the maple trees, the gorgeous sentinels of earth, seem to wear the elegant livery of heaven, I was out one morning duck shooting on the River

Goodwood—so called after a river running through or near the estate of the late Duke of Richmond. The time was the early twilight, just preceding the dawn. Suddenly I heard the voices of a large pack of wolves in full cry after a deer. The wolves were running in thick cover on the opposite side of the river, which, at the point where I stood, was about forty yards wide. The moment was an exciting one; but I have no recollection of having been frightened in the least. I stood close to the edge of the water, ready to tackle them with a single-barrelled muzzle-loader, charged with No. 3 shot, and, at the time, regretted very much that they did not show themselves. The pack passed rapidly on through the dense undergrowth on the opposite shore, and caught the deer in a few minutes, a conclusion indicated by their silence. Sportsmen will not consider the story complete if I do not tell them that daylight immediately appeared, and the No. 3 was put to its legitimate use; and if I remember correctly, ten wild ducks constituted the result of that morning's tramp before breakfast.

On various occasions since the incident above referred to, I have listened to the magnificent melody of the hounds in full cry upon the steaming trail of the deer. Sportsmen need scarcely be told how far such a concert surpasses the highest effort of instrumental music. Everything considered, such a wild, weird, clear sounding musical performance as that with which I was favoured on the morning in question, I have never since heard. The "angry growl" attributed to the wolf by the novelist and literary theorist, who possibly never heard or saw one, and probably know as little, either practically or otherwise, about the animals, as the generality of would-be-witty writers do about the correct mode of rendering the Tipperary idiom—is just so far from the natural habit of the wolf as is the capacity of that animal to play the bagpipes.

Talking of the bagpipes reminds me of an incident which I remember reading about in my young days. In the early settlement of Canada, a Scotch piper was on his way through a forest path to a merry making In passing through a thicket his ears were assailed by the howls of a pack of wolves close around him. There was no use in running away, so Sandy struck up "The Campbells are coming," with might and main, and away scampered the wolves as if pursued by a prairie fire. I do not believe that any animal in America could stand his ground and listen for two minutes to the Highland bagpipes.

So far as I am personally concerned, if accompanied by two thoroughbred bull terriers, and armed with a good Winchester repeating rifle, I shall be delighted at any time or place, in open daylight, to pay my respects to six of the largest wolves in America.

About twelve years ago, the hunting party to which I had the pleasure to belong, was encamped on the bank of Bearbrook, about twelve miles from Ottawa. It was during a cold time in the month of December, a fact which I distinctly remember, in consequence of having had to cut a large supply of birch stovewood to keep the tent warm. During our stay in camp on one occasion about midnight, we were awakened by the howling of wolves near at hand, accompanied by a noise like that produced by a large animal jumping through the snow. Rifles were instantly grasped, but the noise suddenly ceased, and all again was still. By the tracks found in the snow next morning, we discovered that a large buck had galloped within less than one bound of the back end of our tent, and had then turned aside. Upon following the tracks of the deer a short distance, the fresh tracks of two wolves were found on the trail. We did not follow them far. Had we done so, we should, doubtless, soon have discovered the mangled remains of the deer. Had the buck made one more bound in the direction in which he was going, we should have had an immediate row in that tent of more than ordinary interest and excitement. I have often regretted that the deer and the wolves had not landed on top of us in the tent. In that case I could have given you a true story eclipsing in romantic interest the most florid imaginary efforts of the most ingenious newspaper reporter of the present day.

Wolves were very numerous in the Township of Gloucester up to a few years ago, and doubtless there are many still in the solitudes of the vast tamarac swamps still existing within less than twenty-five miles of the City of Ottawa.

During the winter of 1868, Doctor Bell, of New Edinburgh, was driving through the long swamp east of Eastman's Springs. At that time there were lots of wolves within even ten miles of the city of Ottawa. While jogging along at an ordinary gait, the Doctor's horse suddenly became restive, stood still and pricked up his ears in a startled manner. Just then a deer crossed the road a few yards in front of the horse. The poor animal was tired, its tongue was hanging out, and its panting could be heard quite distinctly. The howling of wolves was then heard close at hand, and after a few seconds eleven of those ferocious forest sleuth-hounds rushed across the road on the track of the deer. What a glorious chance for a sure eye, a steady hand, and a good repeating rifle. Although a keen sportsman, the worthy Doctor was armed only with what modern pathological science regards as the most killing weapon of the Faculty, his lancet.

Roman history, at least tradition, tells us that Romulus and Remus, the founders of the ancient city of the Seven Hills, were suckled and reared by a she wolf. If this story be true, the foster mother of those distinguished sons of the Tiber, in her nature, was not all wolf. This incident has been partially paralleled by the story of Androcles and the Lion, and that of Mahdonata and the Puma. All three of these interesting incidents are highly creditable to the character of the brute creation.

It is certain that the ancient Romans inherited none of the characteristic cowardice which fine drawn physiological science might trace to the source of their ancestors' early sustenance. Nevertheless the bloodthirsty instincts of the lupine race were amply exemplified by the humane and gentle rule of many of the Roman Emperors, notably Nero, Caligula, Galba, and Vitellius. Patriotically ferocious selfishness was also conspicuous in the too often misjudged character of Brutus; whose treason against the purest instincts of humanity, in my opinion, was only surpassed by the atrocious turpitude of Judas Iscariot!

The old wolf foster-mother of the founders of Rome, may have polluted some of the rivulets of Italian blood. You may search in vain amongst the Knights of the Stiletto, and the wretched organs-grinders of to-day, for a single heroic counterpart of those stalwart Roman warriors who carried off the Sabine women and bore the victorious eagles of Julius Caesar through ancient Gaul and Britain!

In the history of British America the instances are very rare indeed in which wolves are authentically reported to have attacked human beings. Emboldened by numbers, and stimulated into audacity by hunger, the wolves of Russia and Siberia have, for ages, been a perpetual terror to night travellers in the frigid and inhospitable countries referred to; in the wild forests, and dangerous fastnesses of which, they are met with in such vast multitudes.

In a land where the humanizing influences of a refined civilization, are even yet in their extreme infancy, the dead and wounded, for hundreds of years, upon the battle-fields of intestine wars, were left to rot or be devoured by wild animals. Is it any wonder then, that the wolves of Russia have acquired a taste for human blood, and like the Bengal Tiger, have become man-eaters ?

In contradistinction to the habits of their European congeners, North American wolves, although comparatively bold under the pressure of hunger, commonly dread the presence of man, and flee from him in terror as do the deer and the black bear.

I remember a story current here in old times, about the fate of a gigantic indian named Clouthier—a rather Gallic designation for a pure Algonquin—who was well known to the late "Squire Wright," the original founder of the ancient village of Hull. My story may be true in every particular, for Clouthier was a man of herculean proportions, and almost superhuman strength.

Clouthier was a great hunter, and had a fine field for his prowess and skill in the neighborhood of Hull, which then abounded with bears, deer, moose, wapiti, otters and beaver. In one of his hunting excursions he was attacked and torn to pieces by a large pack of wolves. It was surmised by those who afterwards discovered his bones, and fragments of his clothing, that after he had shot one of his assailants with his single-barrelled flint-lock gun, he had drawn his tomahawk from his belt, and fought desperately for his life.

From the number of skulls and other portions of their bones found at the scene of the tragedy, it was calculated that the indian had killed fourteen of the wolves before he was overpowered. The dead wolves had all been devoured by their fellows, nothing of them being left but their bones. Like his scriptural prototype, the Algonquin Sampson did not fall unavenged.

If this story be correct—and it was considered quite authentic by the old inhabitants of Hull and Bytown—it is the only instance of which I have heard or read, of wolves having attacked man in this part of Canada. On the contrary, I know of several instances in which one man had taken the carcass of a recently killed deer from as many as four wolves, without meeting with any resistance, although without a weapon of any kind.

In a thickly wooded country like Canada, hunting the wolf is necessarily confined to shooting, trapping and poisoning by means of strychnine. The latter mode of destroying wild animals is altogether unsportsmanlike, and, excepting under very peculiar circumstances, ought to be frowned upon and discouraged by all the sportsmen. Leaving out of the question the danger to domestic animals caused by putting out poison, many of the animals killed by this questionable method, wander off a long distance before they die, suffering extreme torture, and are never found

Wolves are seldom seen in the woods, even by those whose avocations oblige them continually to travel through the most solitary fastnesses. So keen is the eye and the ear, and so acute is the wolf's sense of smelling, that the hunter or bushranger is either seen heard or scented before he has any idea that a wolf has been near. Now and then an accidental shot may be obtained, but even such chances are few and far between.

Six years ago; while deer hunting, I saw an enormous wolf on the Madawaska River. He had been started by another hunter on the top of a mountain, and had rushed down the side of a ravine at the end of which I was watching for him. As he came within range, he jumped up and stood upon a log behind two pine trees growing together, which concealed every part of his body but his nose. As that part of his anatomy is not as vulnerable as the nose of a bear, I waited for him to take another step. This, to my great regret, he did not do, but jumped off the log and disappeared in the thick brush and tall weeds. Thus I lost my chance of obtaining a grand trophy; and thus by his escape, I feel that many a beautiful deer afterwards lost its life.

Spearing the wolf, on the open prairie, in the manner of "Pig Sticking" in India, is a most exciting kind of sport, although not always unattended by danger, occasioned by badger-holes and prairie dog towns, which are frequently encountered in the chase.

But the grandest sport with the gray, or as he is called on the prairies, the "timber wolf" may be enjoyed in coursing the animal with strong courageous greyhounds.

Although the grey wolf is an animal of great speed and endurance, he is soon overtaken by those fleet-footed gaze hounds, which, when they overtake him, snap at him and wound him with their sharp teeth and powerful jaws, and by their extreme agility avoid his dangerous attacks, keeping him at bay until the mounted hunter arrives and terminates the chase by a well directed pistol shot. For a time this kind of hunting taxes all the energies of the greyhounds, in consequence of the fleetness and great staying powers of the wolf, a swiftness, however, which may be termed comparatively slow work contrasted with the lightning performances of that telephone of the plains, the "Jack Rabbit," or correctly speaking, the great hare of the prairies.

It has been affirmed by the great naturalists of America, that the aborigines of this country, before the advent of white men, used domesticated wolves instead of dogs. This can readily be credited by any one acquainted with the indian dogs of even the present day. Although smaller in size, a condition superinduced by ages of neglect and starvation, the indian dog of the present is peculiarly and positively wolfish in aspect and characteristics.

It is a notable fact that an irreconcilable antipathy has always existed between the domestic dog and the tamed wolf of the Indians. In their constant quarrels and combats with each other, the former are always the aggressors. The Indian wolf dogs always act upon the defensive ; usually trying to avoid a conflict with their more courageous kinsmen.

In other days, when the lordly bison frequented and ornamented the limitless prairies of the great Northwest, when their million-hoofed tramp shook the solid earth, the wolf was ever his sneaking and persistent enemy. He silently tracked the calves, the wounded, the aged and the helpless, until an opportunity presented itself for a safe attack.

A single white arctic wolf will run down a barren ground caribou and by one savage bite in the flank disable the largest buck.

Sir John Richardson, a distinguished arctic explorer, who has contributed many interesting facts to the general fund of natural history, tells us that the wolves of northern America run down and capture foxes, whenever they find them on the open plains, at a distance from their underground dens. A large wolf is strong enough to carry off an arctic fox in his mouth at a rate of speed far surpassing that of hunters upon snowshoes. They are said frequently to attack and carry off the sleigh dogs of the Indians.

The northern Indians improve the breed of their sleigh dogs by crossing them with wolves. This process adds to their size, speed and strength. The voice of the wolf and that of the Indian dog, to my own personal knowledge, in volume and sound, is precisely similar.

Many years ago I remember having hunted deer with a large sized Indian dog. He was one of the best dogs that I ever turned loose upon a deer track. As he pursued his quarry his tongue was distinctly and unmistakably the howl of of a wolf, loud, clear and prolonged, without a single sharp bark like that of a dog. This dog, true to the instincts of his ancestry, never failed to find a deer, if there was one within reach, and once the game was found, he stuck to the trail like his old progenitors until he tasted blood. I would not mind paying what some of my audience would consider an exorbitant price for such another dog to-day.

When I speak of Indian dogs, I do not mean the miserable diminutive race of singed curs generally found in starving annoyance around an Indian camp to-day. Such attenuated whelps, in my opinion, can trace their origin to the fox; certainly not to the wolf. I allude to the strong and hardy wolf dogs used by the Indians in the Northwest, and by the Esquimaux as they speed along over the snow under the crackling of the aurora borealis in the Arctic Circle.

The late Sheriff Dickson, of Pakenham, who, during many years of his life was, not only a successful deer hunter, but also an enthusiastic student of geology, in an interesting article on the wolf, published in the Canadian Naturalist and Geologist, gives many entertaining particulars respecting the Canadian wolf. From personal experience he bears testimony to the cowardice and treachery of wolves. When caught in a trap, wounded by a gunshot, or cornered up so that they could not escape he invariably killed them with a club or tomahawk, without ever meeting with any resistance. Wolves, he found, could always be frightened away from the carcass of a deer by firing a shot amongst them.

As their only means of escape, when hunted by wolves, deer make for the nearest water. Should the river or lake be narrow, the deer generally swim either up or down. Seldom straight across; and frequently after making a detour of some distance, land again on the same side from which they had entered the water. By this ruse the wolves are puzzled and put off the scent.

If there are weeds or thick brush growing along the shore, a hunted deer will sometimes sink himself under water in a thick clump, so that no part of his body can be seen above the surface but his head, by which his pursuers are baffled. On glare ice the wolf soon ends the chase. When frightened, the deer falls flat at every bound and is quickly overtaken and killed. Should a deer get into a strong rapid and the wolves attempt to follow, they are generally swept off their feet and carried away. If one should approach close enough, a large buck will often kill his foe with one blow from his sharp hoof. Dogs of the courageous kind are sometimes killed in the same manner.

The great and merciless slaughter of deer, however, occurs in the latter part of winter, when the snow is deep and covered by a crust strong enough to bear wolves or dogs, and not sufficiently so to support a deer. Then it is that the wild wolves of the forest, as well as the human wolves of a yet imperfect civilization, relentlessly murder the poor animals in hundreds.

I have now told you nearly all I know about the wolf, and also much of what I have learned from the valuable writings of standard naturalists concerning the life, habits and habitat of this widely distributed member of the great and interesting family of our north American carnivora.

From personal experience, and careful comparison, I have no hesitation in assigning to the wolf of the Ottawa Valley, if not a pre-eminence in size and weight, at least an equality in magnitude, as well as in all the other amiable characteristics distinguishing the genus *lupus* in any other land.

If I have been fortunate enough to add one original fact to the voluminous records of natural history, if I have imparted one instructive idea, if I have succeeded in amusing or entertaining my critical audience, if I have thrown but a single ray of new light upon the wolf, I shall consider myself specially favoured in having achieved more than I expected to accomplish.

REPORT OF THE ZOOLOGICAL BRANCH OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING 18TH MARCH, 1890.

In the year which is just closing there have been no mammals observed in the immediate vicinity of Ottawa, which have not hitherto been seen and more or less accurately described. This does not mean, however, that the field is exhausted, as there is no certainty of such being the case, on the contrary, there are reasons for believing that there yet may be found among the smaller mammals species new to this locality, it being only about three years ago since the hairy-tailed mole (*Scapanus breweri*) was first noted as having been seen in this neighborhood

During the past year two specimens of mole shrew (*Blarina brevicauda*) were caught, one by Mr. Lees in the early part of December in the village of Ottawa East, and the other by Mr. Fletcher in Stewarton in January last, both of which were sent to Mr. Whiteaves of the Geological Museum and duly acknowledged. The one caught by Mr. Lees has been prepared and mounted and placed among the other animals in the museum. One specimen of the field mouse (*Arvicola pennsylvanica*) was caught in Mr. Fletcher's house on the 10th February, after having gnawed off about a yard of a lace curtain where it touched the ground. It gnawed its way into the room through the floor. It is well known that the common house mouse will eat starch quite readily, and probably the field mouse, having a similar taste, was attracted by the starchy dressing of the curtain.

A jumping mouse (*Zapus hudsonius*) was caught near Billings Bridge last summer by Mr. Bartlett, of the city post office, who ought to be a member of this club. The mouse is somewhat rare in this vicinity. It is now mounted and placed in the Geological Museum.

It is hardly necessary to mention that Mr. W. P. Lett gave a very nstructive and interesting lecture on the 21st February on the habits and characteristics of the common grey wolf before the members of this club. The animal in question having been very common in this locality thirty or forty years ago, but now never seen.

We think it well to recommend that in future the different members of the club should be asked to report as soon as possible to the leaders of this branch, for the time being, if they should observe any animal which might be new to them, as important discoveries may often be lost for want of attention just at the time. They think also that it would be desirable to have printed, a list of all the mammals which have ever been known to frequent this neighborhood. Many of the larger kinds have now completely disappeared.

Respectfully submitted,

Ottawa, March 14, 1890.
J. BALLANTYNE, } Leaders.
W. P. LETT. }

CORRESPONDENCE.

To the Editor of the Ottawa Naturalist:

SIR,—In the transactions of the O. F. N. C. for 1883-84, the report of the Ornithological Branch notes that one of its members found the Short-billed Marsh Wren, *Cistothorus stellaris*, "very abundant" in a marsh along the Rideau, about twenty miles from the city. As this is a very rare bird in Ontario, and one whose acquaintance I have never made, I made enquiries about the locality, and on the 9th July my brother, F. A. Saunders, and myself took the C. P. Ry. to Osgoode and went from there to Kars, where we were informed the Marsh Wrens were to be found. The marsh was there, with the usual quota of marsh birds, viz: Florida Gallinule, Bittern, Carolina Rail, Virginia Rail, Red-winged Blackbird and Long-billed Marsh Wren, but though we searched diligently we could find no trace of the short-billed species. All we saw at short range were long-billed, and the only one we shot was of the same species, but as neither of us were familiar with the song of the short-billed, we might possibly have heard it without knowing it. The eggs would have provided a ready means of determining the presence of the Short-billed Wrens had they been laid, but though we examined between twenty and thirty nests, some of them almost if not quite completed, none contained eggs and we were again left in the dark. These nests, however, were the ordinary type of the long-bill, whereas the short-bill is said to build among long rush-like grasses, covering the nest completely on the outside with living blades, so that it is comparatively difficult to find. The nest of the long-bill, placed high in the cat tails, is easily found, in fact the searcher is bewildered by finding three or four nests at one glance, most of which are invariably empty. It would be interesting to know if the authors of this note referred to, took specimens of the bird when the locality was visited before. The Short-billed Wren inhabits a much more restricted region than the other species, and has not, as far as I am aware, been reported as *common* from any other point in Ontario, and as the long-bill is abundant in every suitable locality in Western Ontario, New York State and all adjacent parts south and west, the chances are that the Short-billed Wren if present at Kars at all, is rare. Nevertheless, it is found in its greatest abundance through the States along the Atlantic, and as its numbers gradually diminish the nearer they approach Ontario, it is not impossible that they have been found as stated. I have observed the long-bill species in abundance in the marshes at Toronto, Rondeau, Point Pelee, and Lake St. Clair, and in smaller numbers in little pieces of bulrush marsh through the country, and in all these places they have shown their industry by building several unused nests for every one that is built for breeding purposes, but even then, their numbers are such that the collector has no difficulty in securing all the eggs he may desire. Their song is a medley of unmusical chatter, delivered generally on a short flight into the air, but often while perched on a dead bulrush stalk, and while they are not easily approached if sitting in a conspicuous place, their assurance is such that they will often come fearlessly to within 8 or 10 feet and sing and chatter at the intruder at a great rate, very likely making a big hullabaloo over his approach to the very nest they have decided not to use.

London, Ont. W. E. SAUNDERS.

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EXCURSIONS.

The next general excursion of the Club will be held on Saturday, 9th August, to Eastman's Springs, on the Canada Atlantic Railway. The train will leave Elgin street station at 2 P.M.

The following low rates have been arranged, which should secure a large attendance :—Members of the Club, 25c ; non-members, 30c ; children, 15c. Tickets must be bought from the Club.

September Excursion by vans to Kirk's Ferry on 6th September.

SERPENTINES OF CANADA.

By N. J. GIROUX, F.G.S.A., C.E., P.L.S., of the Geological Survey of Canada.

The study of serpentinous rocks and other serpentines is certainly one of much interest and has been followed with great enthusiasm by several of the most eminent geologists.

As serpentines are met with in almost every country where geological work has seriously been taken up, scientists of all schools took part in the great discussions which ensued from their geognosy and geogeny. Such being the case it may be well to enunciate the views of a few of the best known writers on the subject before describing the mode of occurrence of our Canadian serpentines. The divergence of opinion as to the mode of formation and occurrence of serpentine did not originate until the view was expressed that they were of eruptive origin, and this is not so very long ago, as the most distinguished scientists were all of the opinion, at the beginning of this century that serpentines were stratified contemporaneous deposits. In 1826, Maculloch, in his geological classification of rocks, separated the primitive rocks into two groups, stratified and unstratified, and placed the serpentines and granites together in the latter. But subsequent studies led him to announce that like gneiss or mica-schist, the serpentines are stratified rocks. The great objection then, to classing serpentines with the unstratified rocks was that unlike granite and trap, they had not been found to present dykes or ramifying veins. However, De la Bèche, Brongniart, Elie de Beaumont and many others regarded them as an eruptive rock, and Professor Hitchcock, in 1835, speaking of serpentine says :

" Dr. Maculloch considers it as sometimes stratified ; and accordingly enumerates it in both these classes and also as a veinous rock. It occurs in connection with granite, gneiss, micaceous, chloritic and argillaceous schists."

These characters apply to the serpentine of Massachusetts, according to Professor Hitchcock, who places it along with the limestones in the stratified class. Favre and Stapff regard the serpentines as of aqueous and sedimentary origin. Dr. T. Sterry Hunt in 1859 and 1860 speaking of these rocks said they were undoubtedly indigenous and resulting from the alteration of silico-magnesian sediments, and in many writings since has supported this view of the subject. In the transactions of the Royal Society of Canada, Vol. I, Sec. IV., 1883, is given the geological history of serpentines, including studies of Pre-Cambrian rocks by this author. Very interesting facts and many observations from several European and American geologists are mentioned in this clearly written paper, the most of which are in support of the theory therein advanced. Some of the serpentines that were then declared to be indigenous have been studied more in detail, and facts of recent date, brought to view, tend to show that these are in certain places eruptive.

The serpentines are, as we all know, metamorphic or igneous rocks, and consequently we should not judge of their age from lithological evidence only, for with very few exceptions this criterion is of little value. Since it is generally admitted that metamorphic rocks are not of any particular geological age, so we shall have to consider our serpentines as being also of different ages, for they not only differ in their lithological association but in chemical composition as well.

If we have serpentines that are the altered remains of olivine rocks, we have them derived from some other source as well, for it is impossible to suppose that the banded and slaty serpentines of the Shickshock mountains in Gaspé, and of Long Lake in the Province of Quebec are due to the metamorphism of the same class of stratified beds, the main constituents of which are derived from the trituration of olivine rocks; for in that case they would occur in some characteristic bands, and this is not the case as far as we know.

There is a magnesian rock says Daubrée that is very closely allied to peridotite and therzolite although it presents a great many peculiarities which are not characteristic of these. Although serpentine is hydrated, infusible and without distinct crystallisation, it occurs with eruptive rocks, and the general view of geologists is that it is derived in many cases from peridotite, since it exhibits very often the characteristic form of crystals of that rock.

By his synthetic studics, Daubrée has discovered that very often serpentine has a tendency to change to a peridotite and he is of the opinion that it is derived from the hydration of olivine rocks. There are many views expressed as to the genesis of serpentines and an enumeration of them would require more time than we have at our disposal. It can be stated however that in the opinion of some, serpentines are formed (by metasomatosis) from feldspathic rocks, such as diorites, diabases, granulites, &c., &c., or by a complete elimination of alumina and lime and the replacement of these bases by magnesia; others maintain that they are derived from the transformation of silico-magnesian deposits. Again would it not be possible to suppose that they might be formed from the limestones themselves, when we take into consideration the serpentinic structure of the Eozoon Canadense.

It is also mentioned by some that they are due to the hydration of eruptive olivine rocks, while others hold that they were ejected from the earth's interior in a state of aqueous magma or mud. Some of those who maintain their origin from the hydration of olivine rocks suppose such eruptive rocks to have passed into a hydrous state before being ejected.

If we consider all the transformations we can perform, with different temperatures and under different pressures in our laboratories which are so imperfect as compared to the great, wonderful, and unknown laboratory of the whole universe, we are at no loss in finding theories enough as regards the genesis of serpentines, for hypotheses are easily adopted, even by following the strict and well established chemical and physical laws.

This is not the place nor the time to enter into discussion as to the mode of formation of the rocks which will be described in this short notice as it is the intention of the writer to show, in the best way possible, the characters of our serpentines and their association with rocks of very highly scientific as well as of economic interest, without questioning mother Nature too much as to the course followed by her in giving rise to serpentine and the interesting series of minerals associated with it.

Let us then consider the sepentine as it actually is, a rock which enterprising capitalists, most serious chemists and zealous geologists look upon with so much speculating spirit and such contradictory views, without trying to solve the great problem of origin, a thing beyond reach.

Serpentine occurs in many places in this country, from the far west to the extreme east, associated with strata of different ages, and one would be surprised at the area it occupies on our maps although a great extent of the Dominion is still geologically unknown.

Our serpentine may be divided into four groups :—

1st. The Archæan group, or group No. 1, consisting of the Laurentian, Huronian and Pre-Cambrian serpentines ;

2nd. The Palæozoic group, or group No. 2, consisting of the Cambrian and Carboniferous serpentines ;

3rd. The Cenozoic group, or group No. 3, consisting of the Tertiary serpentines.

4th. Group No. 4, consisting of those of doubtful age.

LAURENTIAN SERPENTINES.

This serpentine is found associated with limestone and dolomite' but is most abundant in the limestone. It is frequently disseminated in grains varying in size, occasionally in scattered masses, and sometimes in interstratified beds. Its color varies from light green, greenish-yellow, pale-yéllowish or greyish-green. It sometimes presents masses of yellowish-green spotted with crimson or blood-red patches from disseminated peroxyd of iron. It has a lower specific gravity, contains less oxyd of iron and more water than ordinary serpentines. It is very widely spread all over the country, and is found in nearly all the provinces.

Near Pisarinco Cove, New Brunswick, are reported crystalline limestones, grey and beautifully white, alternating with quartzites and diorites, and with occasional bluish argillites. Along with these limestones there are also some thinner beds of yellowish and purplish colours which contain serpentine. At another point apple-green and pinkish limestone is enclosed in a bed of diorite, both rocks being traversed by veins of serpentine holding chrysotile. Again, on the west side of the Narrows of the St. John River, in this same Province, can be seen pale grey and white crystalline limestone with a conglomerate of limestone pebbles in a serpentine paste. What is worthy of mentioning of the St. John River serpentinous limestone is that it contains the Eozoon Canadense.

The next areas of the Laurentian rock, which occur in a westward direction, are found in the township of Grenville, on the Ottawa River, Province of Quebec, where it is massive and nearly pure. Its colour is generally pale-yellowish, wax-yellow, or greyish-green, unless it has been penetrated in parts by red peroxyd of iron. In the serpentine of this township have been found very good specimens of Eozoon Canadense. A white lamellar dolomite from this township contains a large proportion of grains of honey-yellow serpentine.

Serpentine rocks analogous to these last are found in the seigniory of La Petite Nation, which adjoins the Township of Grenville. The serpentinous structure of the Eozoon Canadense is beautifully shown in many places in this seigniory, and the best specimens of that fossil exhibited in our museum were first collected there by Mr. James Lowe, who was for some time attached to the Geological Survey staff. Proceeding westward we find serpentinous rock in the Township of Templeton, where it is associated with the so well known mineral apatite. About 50 miles farther west, at the Calumet Falls, on the Ottawa River, pale green serpentine, associated with brown phlogopite and apatite, in a white crystalline limestone, has been described under the name of loganite. To trace the Laurentian serpentine westward we shall have now to cross the Ottawa River and enter the Province of Ontario, where it is first seen in the Township of Ramsay, Lanark County, and about 30 miles south-west of the Township of Templeton. It appears there sometimes of a beautiful amber-color, and in some parts of the township the mineral occurs entirely as disseminated grains through a pure white carbonate of lime, while in others it is distributed in lumps or patches from the size of a pea to that of a medium sized cannon ball. We find very analogous serpentine in Lanark township, and where this mineral is interstratified with the limestone, it forms a rock of striking beauty. On lots 23 and 24, range 3, Township of Dalhousie, the serpentine is interlaminated with a finely granular and brown-weathering crystalline limestone, which, on its weathered surfaces, shows forms very much resembling Eozoon. Similar limestone, without Eozoon structure, is found on lots 26 and 27, range 2.

In the township of South Sherbrooke, which lies due south of the township of Dalhousie, can be seen spotted serpentine limestones which resemble very much those of Grenville on the Ottawa. They abound in veins of chrysotile, present a very rough weathered surface, and appear to be devoid of Eozoon.

In North Burgess, which adjoins Dalhousie, is found massive and nearly pure serpentine. Eozoon Canadense has been found in the serpentine limestone of this township, from which are also reported pure dolomites, with grains of steatitic pyroxene and green or yellowish-green serpentine, also accompanied by Eozoom.

About 20 miles farther south, and in the township of Loborough, county of Frontenac, white and coarsely crystalline dolomite is seen on lot 4, range X. This dolomite leaves, when dissolved in acids, a residue of quartz and serpentine, and contains traces of oxyd of iron and of phosphate.

Serpentine of probable Laurentian age is believed to occur on Wollaston or Hatchet Lake, as well as at the head of Reindeer Lake. Dr. Lawson reports having met serpentine in the Keewatin area, on the west side of Clear Water Lake, a tributary of Rainy Lake. This rock is massive and occurs there in a band, immediately followed to the west by hornblende schist and to the east by another band of green hornblendic schists and altered traps. Another mass of serpentine, in very analogous position, is seen on South Bay of Lake Despair, and Dr. Lawson reports this as occurring with some degree of constancy in the middle portion of the Keewatin trough, and thinks these serpentines are the altered remains of olivine rocks. A small boss of this rock has also been examined by tne same gentleman at the south-west end of Sucker Lake, coming in with green schist. Dr. Lawson, speaking of the serpentines of the Keewatin area of the Lake of the Woods, says :

" This interesting class of rocks is not of extensive occurrence in this area, but is found irregularly distributed in patches of rather ill-defined character and extent." Of the Wiley Point serpentines he speaks thus :

" The quartz-porphyry occupies the greater portion of a small island two and three-quarters miles south-west of Wiley Point, and is evidently associated with a mass of serpentine which occupies a small island beside the north, and the neighboring point on the main shore a little to the south-west. The serpentine on this point presents no definite relations to the other rocks, beyond the fact that it is in contact to the west with dark green somewhat chloritic hornblende schists, and that on the east the point is tipped with a nob of hard crystalline dioritic rock. On another point of the shore, one and a-half miles to the north-east of this occurs a second mass of serpentine, under conditions very similar to those just described. It is in contact to the west with green schists as before, and the extremity of the point occupied by the same dioritic rock, but with this difference, that between the dioritic and the serpentine there is a dyke fifteen feet wide of the quartz-porphyry, evidently an off-shoot from the main mass occupying the island off shore a little to the south. The masses of serpentine in these two points, and on the small island in immediate proximity to the quartz-porphyry, are nearly in a line, and also in a line with the general strike of the rocks at this locality; but whether the serpentine is interbedded with the schists, or was originally intrusive, it is difficult to say from the evidence available in this particular case. The presence of the quartz-porphyry as an intrusion, associated with what appear to be dykes of diorite striking parallel to the dyke of quartz-porphyry, would seem to warrant us in regarding all these rocks—serpentine, diorite and quartz-porphyry—as different manifestations of outflows along a line of fissure, probably at widely-separated intervals, and altered according to the well-known tendency of these rocks, or rather of their original forms." Mr. Bayley has made microscopical examinations of these serpentines, and says that in many of them the forms of the original olivine can be clearly seen, although there is no trace of the mineral left. Dr. Lawson also reports serpentine to be more largely developed on the inland and shore of Shoal Lake Narrows than elsewhere in the region. He mentions also a boss of serpentine projecting through the black hornblende schists in the immediate vicinity of their contact with the gneiss.

Many minerals are associated with the Laurentian serpentine, but very few are found in workable quantity.

Small quantities of chrysotile have been mined for asbestos in lot 2, range 7, Templeton, but the fibre was so coarse and short that these works were soon abandoned.

The magnetic ore formerly smelted at the Marmora iron furnace was obtained from lot 8, range 1, of Belmont. This deposit presented a succession of beds of ore interstratified with layers of greenish talcoid slate and of crystalline limestone, with which were also met serpentine, chlorite, diallage, and a greenish epidotic rock. Iron of a superior quality was manufactured from this deposit.

Pyrallolite, a mineral similar to steatite in chemical composition, softness, and refractory properties, is often met with in the Laurentian series. A bed of it, associated with serpentine, occurs between the gneiss and the limestone on lot 13, range 5, of Grenville. It may be traced thence into range 6, and appears to be in considerable quantity. The colour of this mineral is generally greenish-white or sea-green; some varieties of it are nearly white and have the translucency of porcelain. Very dark-coloured, nearly black varieties, have been described by Dr. Emmons, who says this mineral is capable of being turned in a lathe and wrought like soapstone, and has been made into small vases, inkstands and similar objects. Much of the figure-stone, or pagodite, of which the Chinese carve various ornaments, appears to be pyrallolite. It was used by the aborigines to make pipes and calumets.

The serpentine of lot 13, range 5, Grenville, and of some parts of the Township of Burgess, is of a pale-green colour, marked with spots of iron, and forms a fine ornamental stone.

The limestones of the Laurentian series are very important, not only on account of their extent, or their association with serpentine and apatite, but from the fact that wherever they occur the Laurentian region presents fine fertile valleys fit for cultivation. The principal settlements found among these rocks are upon the outcrop of the limestone bands. These limestones afford excellent lime as well as good materials.

The Laurentian serpentine on account of being light in colour in many places could be ground, and subsequently impregnated, by a peculiar process, with various mineral and vegetable colour, and then used for the manufacture of cheap and durable paints of various hues.

HURONIAN SERPENTINES.

These are but little known and of very limited extent.

Messrs. Bailey and Matthew report as follows of a series of rocks of Charlotte County, New Brunswick, which they suppose to belong to the Laurentian system :—

" With the ordinary type, however, there occur at two points to the north-east of St. Stephen, rocks of very different aspect. These are the dark grey dioritic rocks containing serpentine, diallage and chromic oxyd. About two miles north of St. Stephen, may be seen ledges of coarse grained, dark grey granitoid diorite, having thin layers of picrolite or fibrous serpentine in the joints as well as serpentinous matter in the body of the rock. In crossing these ledges towards St. Stephen, the rock becomes somewhat darker, and portions are met with exhibiting thin lamination, the laminæ being separated by layers of serpentine about one-eighth of an inch in thickness." There seems to be some doubt as to the age of these serpentinous rocks, and although supposed to be of Laurentian age, they are here placed under the head of Huronian rocks. The presence of chromic oxyd in them and the want of crystalline limestone in their association with other rocks give them quite a different character to those of the Laurentian series of this Province. The first outcrops of these serpentines which we know of, in a north-westward direction from these last mentioned are on Lake Abittibi where they are found to be associated with micaceous, hornblendic, and chloritic schists, fine grained hard quartzites, diorites and dioritic schists. A little island in this lake is composed of strongly magnetic serpentine with splintery fracture, resinous lustre and weathering dull white. An analysis of it was made by Dr. Harrington who found it to contain grains of chromic iron and a very small quantity of nickel besides silica, alumina, protoxyd of iron and magnesia.

According to Dr. Bell there is, in the middle of Pigeon Lake, and at about one mile from the lower end of it, a small island composed of very dark green serpentine, with strings of calcspar and crysotile. It weathers rusty, and Dr. Harrington, on analysis, found it to contain oxyd of chromium, both in the form of small grains and in chemical combination with the rest of the rock.

No mineral of economic importance has yet been found in these serpentines, but perhaps when the country where they are more abundantly met with is settled, some wandering geologist or hard-working *habitant* will discover in them large deposits of asbestos or other valuable mineral.

PRE-CAMBRIAN SERPENTINES.

Of these very little can be said; they seem to be limited to the almost extreme easterly portion of the Dominion. Mr. Hugh Fletcher, who so very carefully studied that section of the country, reports serpentines to occur in three different places :—

First, in Macdonald Brook, Cape Breton Island, where white, pyritous crystalline limestone, lemon-yellow serpentine limestone, and pale-green brown-weathering limestone, and tremolite in small fibrous tufts, occur between bluish-grey and red felsite and bluish-porphyritic felsite. Then on Kelvin Brook, in the same island, a cliff of coarse, reddish felsite, associated with greenish and red, mottled, soft serpentine, is in immediate contact with reddish coarse grit and conglomerate along an irregular line which runs N. 9° E.

On Campbell Brook, eastern Nova Scotia, some white crystalline limestone appears, some beds of which are covered on the surface with large knobs of light-greenish and white serpentine, but the hills are composed mainly of syenite.

These resemble very much the Laurentian serpentines in colour and in their association with crystalline limestones. No minerals of economic value were found in them.

CAMBRIAN SERPENTINES.

The most easterly outcrops of these are found in the Shickshock Mountains, Gaspé Peninsula.

*Mount Albert, which is one of the main peaks, is composed of serpentine. The thickness of this great mass is estimated to be about 1,000 feet The whole of it presents evidence of stratification, in some parts remarkably clear and distinct, in others more obscure. Much of the lower 600 feet is bottle-green in colour, with beds towards the top of a streaked and mottled reddish and greenish brown, much studded with small crystals of diallage. The upper 400 feet display the bedding very beautifully, by difference of colour on the weathered exterior, as well as in freshly exposed surfaces. The weathered surfaces are marked by a set of red and opaque white bands, the white broader than the red, varying from one-eighth of an inch to an inch in thickness, and becoming often interstratified with layers of a brownish fawn colour, which

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*From Geology of Canada, 1863, page 266.

vary in breadth. When cut and polished, this serpentine displays dark brown parallel bands, with thin blood-red vein-like lines, running through those which are red on the weathered surface. These red lines are sometimes disposed after the manner of false bedding. Very thin parallel bands of asbestos are found separating the red layers, together with occasional crystals of diallage; both of these, in certain lights, give golden-red reflections. With the red bands, chromic iron ore is associated, which is sometimes diffused in grains along the layers. Occasionally minute faults displace the layers, and where they cross those which contain chromic iron, the fissures connected with the fault are filled with the ore for some distance on each side. Beds of chromic iron, of two and three inches in thickness, are met with in several parts, and somewhat above the well stratified serpentine, the ore occurs on the surface in considerable quantity, in large loose angular blocks, which are traceable on the strike for some distance, showing that workable masses are probably imbedded in the rocks.

Mr. Richardson's explorations during the summer of 1878 have shown that this serpentine is close to important rock-masses of olivine, which have undoubtedly given rise to it. Dr. Harrington made a microscopical examination of a sample collected by Mr. Richardson, and reports on it as follows :

" It shows a few minute black grains, probably of chromite, and rarely a little of a fibrous mineral which resembles enstatite." According to Dr. Harrington the olivine rock from Mount Albert is probably not eruptive.

Speaking of that part of the Notre Dame range, Dr. Ells, in the Geological Survey Report for 1882-83-84, says :

" Among the prominent features of the Shickshock range are the two bare hills of serpentine, the one on the eastern extremity overlooking the forks of the Ste. Anne River, and known as Mount Albert ; the other twelve miles west, on the Salmon branch, and called by Sir Wm. Logan the South Mountain. Of these the former was carefully studied and is described by Mr. A. P. Low, while the latter was the only one accessible to us. The latter presents a bold bluff on the south and west, rising to a height of over 1,200 feet above the Salmon branch, and extends for about two miles and a half east. The surface, like that of

Mount Albert, is either bare rock or is slightly clothed with a scattering growth of stunted spruces from five to twelve feet high, and small ponds with marshy edges occupy the depressions. The width of this mass of serpentine and associated rocks is about three-eighths of a mile. It rests upon the south flank of the hornblende schists, and terminates abruptly on the east bank of the branch, though a spur from its southern flank, of forty yards in width, crosses the stream in close contact with crystalline dolomitic rock.

The serpentine of this mountain apparently lacks the stratification seen in that of Mount Albert, and no traces of asbestos or chromic iron were discovered. On weathered surfaces it is exceedingly rough and ochreous.

Although the serpentines of this area have generally been regarded as an integral portion of the metamorphic series and contemporaneous in age, there are indications, at several places, which point to an eruptive origin. The position of the eastern or Mount Albert mass in particular, breaking, as it does, apparently across strata of Pre-Cambrian and Silurian age, gives it the aspect of an immense dyke, while the exposure noted as crossing the Salmon Branch, much of which is of peculiar character, is also like an intrusive rock.

In the Geological Survey Report for 1882-84, Mr. A. P. Low reports as follows of the olivine and serpentine of the Shickshocks :—

" These rocks are largely developed at the eastern extremity of the Shickshock range, and form the prominent peak of Mount Albert. They extend in a south-westerly course from the west side of Table-top Mountain across the south branch of the Ste. Anne River to Mount Albert, which is about the centre of the mass, and thence to the head water of the east fork of the Salmon Branch of the Cascapedia River, making a total length of twelve miles. The greatest breadth is four miles, on Mount Albert, but the average is not more than two and a half miles.

The rocks are chiefly olivine, more or less changed into a dark green serpentine, associated with patches of mottled brownish-red, the whole overlaid by banded beds. The green serpentine has sometimes a course, fibrous structure (picrolite), but the quantity is small and the quality not fine enough to make it commercially valuable as asbestos.

All the rock seen in Mount Albert was altered into the above serpentine, but on the eastern slopes, along the Ste. Anne River, olivine was found only slightly decomposed upon weathered surfaces.

These rocks all change to a light buff colour where they are exposed to the action of the atmosphere; and as the soil above them is very poor, supporting little or no vegetation, a dead appearance is given to the scenery.

Banded structure is distinctly seen amongst the serpentine in the mountains, but the direction of the strike of the beds is not continuous nor parallel to that of the surrounding stratified schists, and is supposed to be due to flow structure, as the olivine is undoubtedly of igneous origin. Chromic iron is found associated with the green serpentine, and seems to be confined to certain beds of the rock, as it is found scattered along the strike in loose blocks, some of which are ten inches in diameter. This mineral was observed on the surface near the banded beds of serpentine, at the north-east side of the mountain, and also along a bed about two miles south of the first place. The ore was found to occur in small, widely separated pockets, scattered through the serpentine, and where seen is not in sufficient quantity for profitable mining.

Where the olivine crosses the Ste. Anne River, veins of steatite of a light green colour were observed, but the cost of transportation renders them of no economic value."

Mr. Frank D. Adams made a microscopical examination of a slice of the Mount Albert rock, and gives the following description of it:

"This rock, which is very fresh, is in section seen to be composed of olivine, arranged in very irregular bands of larger and smaller grains, together with a small quantity of an opaque-black iron ore, which, judging from its association with the olivine, is probably iron ore. A few grains of a very light brownish-green fibrous mineral, some of which show parallel extinction, are also present. These are probably enstatite, but none of them are cut so as to enable this to be determined with certainty. An interesting point in connection with this rock is that each grain of iron ore is surrounded by a greenish ring composed of an aggregate of wavy fibres, which in a few cases, where they were sufficiently large for examination were found to have a parallel extinction, and which resemble serpentine. It is an olivine rock."

The next areas of Cambrian Serpentines are those which occur in Eastern Canada, or more generally known as the Eastern Townships serpentines. They are by far the most important ones of the whole Dominion, not only on account of affording rich minerals, but also as being considered by some as an altered metamorphic rock contemporaneous in age with those highly metamorphosed strata which constitute the Quebec group.

Ever since the establishment of the Geological Survey, work has been done almost every year in that part of the Province of Quebec called the Eastern Townships, and very highly interesting facts have been collected by the different gentlemen of the Geological staff who were given this section of the country to work out; but it is not until 1886 that the first geological map of a part of that section of our territory was published to accompany Dr. Ells's report of that same year. Though no map had previously been published, much had been said of the complicated set of rocks of that region, not omitting the famous serpentines which very often form vast masses almost without admixture, and at other times, enclose diallage, actinolite, garnet, and chromic iron, or are intermingled with carbonate of lime, dolomite and sometimes with ferruginous magnesite, forming varieties of ophiolite rock into which talc often enters. They almost always contain small portions of chrome and nickel while these two metals appear to be altogether wanting in the similar rocks of the Laurentian series.

These serpentines which are closely allied to a band of diorite and dioritic rocks, extend from the Township of Potton, on the west side of Lake Memphremagog, and a few miles only north of the International Boundary line, in a north-eastward direction across the St. Francis River, or a stretch of about 115 miles. They appear in irregular but generally well defined masses and bosses, and although showing only here and there, the most of that distance, they do not deviate from the aforesaid direction except in the Townships of Shepton and Cleveland where they were around eastward towards the Township of Ham, whence they follow the general trend of all the formation, which is north-east. Sir Wm. Logan and Dr. T. Sterry Hunt held these serpentines to be of sedimentary origin, but Dr. Selwyn in the Geological Survey report of 1877-78, says :—

" I think there are very few who would agree with Dr. Hunt in the general proposition that the diorites and serpentines of the Quebec group are of sedimentary origin...."

Most of these serpentines however are almost always associated with dioritic rocks of which Dr. Ells reported as follows in 1885 :—

" Dioritic rocks are found at many points throughout the Townships, sometimes in masses of large extent, as in the Big Ham and Little Ham Mountains, and in the peaks along the western side of Lake Memphremagog ; at others, as bosses and dykes. With these are often associated dioritic agglomerates, serpentines and serpentinous breccias."

In places massive serpentines are in immediate contact with black slates, and in others, very much broken and slaty serpentines, different in character, in colour and in touch, are found in what appear to be exactly the same black slates. To say that all the Eastern Township serpentines are or are not intrusive is a question that can be solved only after a long and very careful study of the whole region. There are undoubtedly two very distinct sets of serpentines in this field, but whether their difference is due to age, or origin, or both, is still an unsolved problem.

These serpentines are generally darker coloured, tougher and better fitted for ornamental purposes than those of the Laurentian series. Ophiolites, which are chiefly mixtures of limestone or of dolomite and serpentine, the latter predominating, are found in many places in the Eastern Towships.

Many minerals of great importance are found either associated or in close proximity to serpentine in this region, and in order to show the importance attached to the study of this class of rocks, an idea of the economic value of these will be given.

The old Huntington copper mine, in the Tonship of Bolton, is just in the midst of serpentine and serpentinous rocks ; the Brompton Lake copper mine, in the Township of Orford, is also located in the serpentine. Variegated and vitreous sulphurets of copper disseminated in small masses in a bed of grey tough serpentine rock, four feet in width and flanked by serpentine on each side, occur on lot 28, range 9, Brompton. According to the Crown Land survey, a quartzose chloritic rock near a band of serpentine, in Orford, contains a small amount of copper pyrites. On lot 9, range A, Orford, and near the junction of the serpentine with a diallagic diorite, six quartz veins occur in the latter rock within a breadth of twenty-five feet. Some of these are ten inches wide, and they all contain portions of yellow copper ore which is associated with a greenish serpentine-like material. On lot 22, range 1, Garthby, a large mass of iron and copper pyrites is found subordinate to the stratification of the enclosing rock, which is a calcareous serpentine.

Iron ores are also found in many places in the Townships associated with serpentine Large loose blocks of magnetic ore, sometimes half a ton in weight, are found on the second lot of the tenth range of Leeds. They are near a band of serpentine, and probably not far removed from the parent rock.

An important deposit of magnetite is found on the west side of Nicolet Lake in serpentine.

Of chromic iron, Dr. Ells reports as follows :

"Chromic iron is found in connection with the serpentines at several places in the area under consideration" (the Eastern Townships). "A deposit on the south side of Lake Nicolet, lot 4, range 2, Ham, was open some years ago, and about ten tons extracted, but the indications were not sufficiently favorable to warrant a continuation of the work. Within the last five years, several openings have been made near Bellmina (lot 24, range 3, Wolfestown), on the crest of the serpentine ridge at this locality. The deposits are apparently of the nature of irregular pockets. From the most important of these about twenty tons were extracted from a shaft fifteen feet deep. The vein was five feet wide at the surface, but decreased to three feet at the bottom of the shaft. Two hundred yards east of this spot, a second opening was made, which produced two to three tons in pieces scattered through the serpentine. Other small deposits were also found, and in all about 25 tons were obtained."

An opening has been made by Dr. Reid in chromic iron on lot 16, range 4 of Thetford. The mineral occurs there in pockets and very small irregular veins in an asbestos-bearing serpentine.

In the seigniory of St. Francis Beauce, there is a bed of granular iron ore, forty.five feet wide, in serpentine. This ore is composed of common magnetic oxyd of iron and ilmenite.

As already stated, nickel is seldom or never absent from the serpentine of this area, but rarely forms more than two or three thousandths of the minerals in which it generally appears to be combined as a silicate. With the chrome-garnet of Oxford, the sulphuret of nickel (millerite), occurs in small grains and prismatic crystals, disseminated through the mixture of garnet and calcite in small quantity.

The most important mineral found in the Eastern Township serpentine is chrysotile, generally called asbestus, although the true asbestus is a fibrous tremolite or hornblende.

Of this mineral, which traverses the serpentine in irregular veins, varying in size from mere threads to a thickness of five or six inches, much has been said by Dr. Ells in his two last reports on the Eastern Townships. This mineral, which is undoubtedly a segregated one, is supposed by some to have been formed during the cooling of the mass in which it is found. They compare the cooling surpentine to a mass of cooling molasses, and say that asbestus is formed in the same way as the thin sugar fibres are produced in this substance when it is drawn out in the working. Acccording to this theory the longer asbestus veins would be the finer; but it happens to be the contrary. Moreover, how in this way could the presence of chromic iron, which is sometimes highly magnetic, be explained as occurring in veins in the asbestus veins themselves, cutting the latter very often into two equal parts?

The existence of asbestus in this country was detected by Sir Wm. Logan in 1851; bnt it was only iu 1877 that the first deposit of any commercial value was discovered. A *habitant* by the name of Fecteau was the happy finder.

In 1878 Messrs. Ward, John Johnston, Andrew Johnston and the Honorable George Irvine opened the first asbestus mine.

Asbestus was but little known by the ancient people, who used it only for the manufacture of cloths in which were placed the bodies of the great and distinguished men for cremation. By so doing they could keep their ashes from being mixed with any impurity. This minera was then scarce and very costly; its property of not being consumed by fire made it a wonderful and even a marvellous thing. It used to be then kept as an object of curiosity rather than of commercial value. Even in the seventeenth century asbestus was employed in the manufacture of handkerchiefs and a few garments which were used in scientific lectures and representations of all sorts to illustrate, in a pleasant way, the non-conductibility of this silicate, which serves to-day for the manufacture of paints, cements, putties, wall-papers, mill boards, parchments and cloths. Mixed with tripoli it is used for packing and insulating steam and other pipes, as well as for lining safes. It is also used in the manufacture of drop-curtains and the sceneries in theatres, of suits for firemen, of safety ladders, of belts used in chemical works, and the last but not the least in the making of pipes.

Soapstone, which is more or less compact talc, is found in many places in the Townships, and is very often associated with serpentine. When pure and compact this mineral is much used as a refractory material for lining furnaces, especially those destined for anthracite. From its softness it is readily cut with knives and saws into the required shape, and it is infusible in any ordinary furnace heat. It is also used in the construction of small portable furnaces, and of open stoves, which are made of plates of it held together by iron bands and rods. Culinary vessels are made of it, and it has also been bored for water-pipes, and for the lining of cisterns for acid and alkaline liquids. When very strongly heated, soapstone looses the small quantity of combined water which it contains, and becomes much harder and susceptible of a polish. It may then be colored by various solutions , and it has been used in this manner for the manufacture of buttons and of some other small articles. Jets for gas-burners are also made of this hardened soapstone, and have the advantage of not being liable to rust or corrode. When reduced to powder its softness and unctuosity have caused it to be used, like plumbago, as a lubricator, and when mixed with a small proportion of white lead it forms a hard cement-like pigment, which is claimed to equal in resistance many of the more expensive fire-proof paints. It is also well adapted for a filer in the manufacture of paper. Slate pencils and tailors' chalk are also made of it.

Among the rocks of the Quebec group, in Eastern Canada, argillites fit for roofing slates occur in many places and have been successfully worked.

In the Township of Melbourne these slates, which are in contact with dark-green serpentine, afford excellent roofing slates, and are extensively quarried for that purpose by the New Rockland Slate Co.

This serpentine is not only well adapted for interior decorative purposes but can also be used for the manufacture of small articles such as chandeliers, inkstands, paper weights, etc., etc.

In France serpentine is used for the manufacture of sulphate of magnesia or epsom salt. The magnesia which may easily be obtained from this sulphate makes fine hydraulic cements particularly well fitted for constructions exposed to the action of sea-water.

CARBONIFEROUS SERPENTINES.

These constitute the last of group No. 2 or the palæozoic serpentines, and so far as we know, are of very limited extent.

In the Geological Survey report for 1877-78, page 93 B, Dr. Dawson speaking of the rocks of Cache Creek series, British Columbia, says:

"Whatever uncertainty might remain with regard to the region now in question has been set at rest by the discovery of fusuline limestone on the Bonaparte, interbedded with the siliceous and serpentinous rocks. The occurrence of serpentine and other metamorphic rocks of ancient appearance in beds of carboniferous age, is in itself a point of considerable interest. In the place above referred to, it is said that "the limestones holding these fossils are so intimately associated and interbedded with the serpentines and other crystalline rocks above described, as to leave no doubt that they all belong to the same series." This statement I have been able to confirm by the examination of many additional localities. Between Hat Creek and 124 miles past (Mundorf's) numerous exposures in the roadside show the intimate association and interbedding of the cherty siliceous rocks with serpentines pure and impure, and of the latter with volcanic breccias of greenish-grey colour."

Of the serpentines of the Bonaparte River, Dr. Dawson reports as follows:—

"They may often be recognized at a distance by the bluish banks, bare of vegetation, which they produce on weathering. Here the relation between the serpentine and other rocks was most clearly seen. . . There can be little doubt that serpentines in this group of rocks have been igneous materials of some sort, and perhaps owe their conversion to serpentine to the same hydrothermal or other action which has produced from siliceous sediments, the great mass of cherty quartzite."

CENOZOIC SERPENTINES.

These, also, like the last referred to, occur in British Columbia.

Dr. Harrington reported as follows on them :—

"Olivine has been detected in several of the eruptive rocks of British Columbia. One of these, of Tertiary age, from Kamloops, affords most beautiful examples of the alteration of olivine to serpentine. It is massive, rather fine-grained, and of a very dark olive-green colour. The examination of a slide with the microscope shows that originally the rock must have consisted of crystals and grains of olivine, augite (mostly in crystals), and a small proportion of plagioclase feldspar and magnetite. But while the augite mostly remains fresh, a large part of the olivine, which appears to be the most abundant constituent of the rock, has been altered to serpentine. Most of the olivine crystals and grains retain a nucleus of the unaltered mineral, showing the characteristic rifts, and the outlines of many crystals which are partly or entirely converted into serpentine are still perfectly sharp."

No economic minerals have yet been found in these serpentines, as well as in the carboniferous ones, but future researches and study may lead to some valuable finds in them.

We have now come to the last group or the one in which have been classed the serpentines of doubtful age, and which are found to the north of Lake St. John, Province of Quebec, and in the Yukon district.

Of these north of Lake St. John, Mr. Richardson reported as follows :

"About 200 yards west of the portage road, a cone-shaped hill, which rises over the waters of the narrows about 160 feet, is entirely composed of serpentine. This rock is traced on one side to the portage, and on the other it is supposed to form part of Juggler's Mountain, which is about 400 feet high, and is about two miles distant. On the highest part of the cone referred to, there is a blackish limestone, about one foot thick, interstratified with serpentine."

Dr. Hunt, while examining these rocks, had a portion of the limestone sliced for examination under the microscope, which revealed a structure resembling that of some coral. The serpentines, which are dark-coloured opaque, and contain much disseminated magnetic iron, yield by analysis considerable portions of chrome and traces of nickel.

Dr. Dawson in his report on the Yukon district says :

" A specimen of asbestus (chrysotile), being part of a small vein of that material about half an inch in thickness, has been brought from the Stewart River, and the occurrence of serpentine in large mass elsewhere tends to show that valuable asbestus deposits may yet be found in the region."

If we now go out of our own Dominion we see that the Cambrian serpentines of the Eastern Townships which extend to Gaspé Peninsula are spoken of as occurring in the island of Newfoundland, and Mr. Alexander Murray, in 1876, speaking of the different ores found in this island, said :

"The more valuable ores hitherto discovered upon this island, notably those of copper, nickel and chromic iron, have usually been found to be closely associated with serpentinous rocks ; and the presence of such rocks has frequently instigated close inspection of the ground, resulting in the discovery of satisfactory metallic indications." In a paper read by Dr. E. D. Peters at the last meeting of the American Institute of Mining Engineers, which was held here last fall, is found the following statement : "The entire world's production of nickel annually is less than 1000 tons, the bulk of this being produced by the New Caledonian nickel mines, which are oxyd deposits situated in serpentine dyke."

In the Urals, platinum associated with chromic iron is found in a rock of serpentinous matrix.

In Science, vol. 8, 1886, is given a very interesting article on the genesis of the diamond, by H. C. Lewis. He refers to the diamonds of Kimberley, South Africa, and on examination of the adamantiferous rock, as well as of the ore which is free from diamonds, he says that :—

" Both are dark, heavy basic rocks, composed essentially of olivine, and belong to the group of peridotites. Both are similar in structure and construction, differing only in the presence or absence of inclusions. The rock consists mainly of olivine crystals lying porphyritically in a serpentinic ground-mass."

Let us, then, hope that our Canadian serpentines, which are proved to be in many places the altered remains of olivine rock, not only contain asbestus, the mineral of the day, which is not attacked by fire, but that we will find them, in a close future, affording also the mineral which the greatest heat and pressure of our laboratories could not yet produce, the diamond.

——:o:——

BOOK NOTICE.

ARTIFICIAL KEYS TO THE GENERA AND SPECIES OF MOSSES in Lesquereux and James's Manual of the Mosses of North America ; by Charles R. Barnes ; pp. 72 ; 1890.

Under the above caption Prof. Barnes has published in the Transactions of the Wisconsin Academy of Sciences (and also separately) a most useful article. After the Ferns there is perhaps no order of plants whice is more invariably admired by those who love nature than the Mosses; their study, however, has been almost impossible owing to the want of an intelligible work which could be used by a beginner. In this way many who might have had their attention drawn to the study of botany by these beautiful objects, have been lost to the science. For botanists, unlike poets, need not be born botanists, but can be made by accident or training. By the publication of Prof. Barnes's pamphlet a great obstacle to the study of mosses is removed, and we feel sure that many of our members will now avail themselves of this opportunity. This should be particularly the case with our local members, for we have in Prof. Macoun, who is always courteous and willing to help beginners, the highest Canadian authority upon mosses. The above mentioned pamphlet is well printed, and sewed so as to open flat, and can be obtained through the editor for 50 cents a copy. J. F.

NEW MEMBERS.

Bethune, Rev. C. J. S , *M.A.*, *D.C.L.*
(Port Hope).
Campbell, A. M. (Perth, Ont.)
Deeks, W.E., *B.A.*
Macfarlane, T., *M.E.*,*F.R.S.C.*
Meneilly, W. J .
Ripley, C. J.
Ross, Niles G.
Smith, Miss Ethel M.
Smith, Miss Eloise.
Sutherland, Miss Christine F.
Sutherland, J. C. (Richmond, Q.)
Topley, W. J.

MONDAY AFTERNOON POPULAR LECTURES.

ZOOLOGY.

IDEAS ON THE BEGINNING OF LIFE.

By J. Ballantyne.

(Read February 10, 1890.)

Organic life, as you all know, is arranged by naturalists into two great divisions, named respectively the vegetable and animal kingdoms, the last named of which being the subject matter of this paper.

To the ordinary observer the difference between plants and animals can be seen at once, as only the higher or more specialised forms are compared, but with the naturalist, who digs down into the lower forms of life, distinctions all but disappear, so that he finds it impossible to fix the point where the diverging lines of life really begin, or to say whether vegetable or animal life had precedence in the order of their beginning in the far distant past· Dr. Andrew Wilson, of Edinburgh, in his work "Chapters on Evolution," says: "In the lowest deeps of plant life we may discover organisms which possess at the best a doubtful title to be regarded as objects of botanical study. In the animal world, likewise, are included lower organisms which may be regarded in certain aspects as possessing true relationship with plants. Modern biology to-day frankly admits its inability to pronounce whether certain lowest forms of life are animals or plants, certain 'monads,' for example, consisting each of a speck of protoplasm provided with microscopic whip-tails, exhibit a highly confusing identity of structure and function which renders their exact nature indeterminable, or at least highly doubtful. Hence we discover that apparently at the lowest confines of the animal and plant realms, we enter a biological 'no man's land,' whereof the included inhabitants may legitimately claim relationship with both kingdoms. They exhibit in this latter respect, in the eyes of biologists, the actual survivals of that early epoch in the history of life's development when the specialized kingdoms of animals and plants were not, and when existence passed placidly along the common lines which were soon to diverge into two great series of living beings that environ our footsteps to-day."

Zoology in its widest sense may aim at a full and complete knowledge of animal life, from the simple cell of the lowest protozoon to that of the most complex or differentiated structure in existence. It may not only be a knowledge of animal life as it now exists, with its almost infinite number of variations and complexities, but it may extend its researches away back for countless ages and inquire into their origin or beginning—inquire from whence they came and whither they are tending. Truly a vast subject.

In the ordinary study of animal life the various kinds are grouped together in a certain order. The number of the different sorts of animals being very great—much greater than that of plants—and the diversity among them also being greater, a division of the same into branches relating to different groups may naturally take place, as without an arrangement of this kind it would be almost impossible to describe an animal in such a way as to enable the student to find very readily any particular animal described. This method of grouping animals together is somewhat as follows: Supposing we take up that branch of zoology which has for its subject bird life, or ornithology—(*ornis* a bird, *logoŝ* a discourse). The first step in classification would be to ascertain some peculiarity common to all animals which go by the name of bird. It would occur to most of us at once that all birds have feathers, and that no other animal is similarly clothed. This one characteristic would be sufficient to determine a bird's place among animals. Having got this far, it would very soon be perceived that structural differences, particularly in the feet, existed among birds, some having three toes, some four, some with three in front and one behind, some with two in front and two behind, others again with three in front only, some with their toes joined together with a thin skinny web, and several other points of difference. It would be quite natural to begin classification by grouping together all the birds having the same kind of feet. We would not think of placing a bird with feet adapted for perching in the same group with those with feet adapted for swimming. We would soon have several large orders of birds arranged by their feet peculiarities; but this grouping would not be sufficiently definite, as many birds with feet somewhat alike are very different in other respects; so that in order to designate any particular bird with certainty these orders would require to be subdivided a good many times, always selecting those which have most things in common, and grouping them by themselves. By narrowing down in this way it is comparatively easy to find out the name of any bird from the descriptions usually given in works on ornithology. In like manner in all the other divisions into which animal life is arranged, classification is carried out. The necessity for classifying the different sorts of animals into such groups as I have tried to point out must be so apparent to all that there need be nothing further said on the subject.

The study of the various forms of animal life with all their never ending peculiatities, their relations to each other—their habits and instincts, &c., must always be of great interest to man, but that branch of scientific research, which takes for its subject the origin of life, together with the origin of species, opens up fields of speculation of much greater interest, and which bid fair to revolutionize our whole conception of the manner in which man as well as all other organisms came to be as we now find them.

It is my purpose to try and point out as briefly and as clearly as I can some of the views held by leading scientists of the present day on the subject just named. Up to a very recent period the belief was all but universal that all living creatures came from the hands of their creator perfectly formed and perfectly fitted to the surrounding world in which they had their habitation, that a power outside and beyond what we call nature brought life into existence from nothing, and that it was so continued in the same unchanged and unchangable condition throughout all the time of its existence. It was claimed that God had infallibly revealed to man the order and plan of creation, and consequently there was no room for discussing or inquiring into the subject at all. The few people who had the timerity to doubt the finality of the biblical conclusions, as then understood, suffered no little in the way social and physical persecution.

The investigation of nature, principally during the past half century, has not only shaken the belief in the theological explanation of the world and of life, but has given rise to new theories concerning the beginning of life and the causes accounting for all its varied forms.

As the structure and make up of the earth came to be investigated there were found, as Mr. Billings told us a few evenings ago, the imprint or remains of figures in the rocks which strongly resembled the organic structure of plants and animals. To account for these apparent remnants of life, various conjectures were advanced, the one most generally acceptable among theologians for a time being the great flood of Noah as recorded in the Book of Genesis, which was a sufficient explanation, and the organic remains found in the rocks bore testimony to the fact that such a great deluge had really taken place. As the work of geological investigation proceeded it soon became evident that the generally conceived idea of creation, as found in the Mosaic records was not in accordance with facts, and that a different interpretation was necessary in order to reconcile the apparently conflicting records, one of the difficulties being the existence of organic remains so deeply embedded in the rocks, that it was utterly impossible to conceive how they could have been placed in such a position in the short period of six days, or how a temporary flood existing less than one year could bring about such tremendous changes in the surface of the earth.

Hugh Miller, the Scotch geologist, in his work entitled the "Testimony of the Rocks," written about forty years ago, makes an attempt to reconcile the geology of the Pentateuch with the geology of nature by the hypothesis, that the days mentioned in the first chapter of the book of Genesis do not represent the actual duration of the successive periods of creation, but only the time occupied by God in unrolling a panoramic vision of these periods before the eyes of Moses on the Mount. Another form of reconciliation advanced and very generally accepted by believers in the scientific accuracy of the Mosaic records, and which it is maintained the original text fully warrants, is that the days mentioned in the book of Genesis were not days of twenty-four hours each, and that the Hebrew word translated into the word day in our common English version of the Bible is used in other places to signify a period of time which might be indefinitely prolonged.

The Hon. W. E. Gladstone very recently undertook to show that the order of creation as recorded by Moses was in complete harmony with the order recorded in the rocks and that there was no conflict between religion and science. He attempts to show that there were four periods of time in which all organic life appeared upon the earth, and that the order in which geology tells how they came, was in no way different from that told by Moses. The four periods were as follows:—First, a period in which all vegetable life came into being ; second, a period in which aquatic or water-living animals appeared, and third, a period in which fowls of the air and all winged animals began to exist, and fourth, a period in which earth and land animals appeared with man as head over all.

Mr. Thos. Huxley, in reply, maintains that the testimony of the rocks does not warrant a belief in any distinctive periods in which plants and animals first made their appearance, but appears to think that the lower forms of life, whether of plants or of animals, came into existence about the same time. In that school of scientists who have accepted the general theory of evolution as sufficient to account for all the varied and ever changing forms of life, it is held that the beginning of life itself was simply a phase of matter, and was no more mysterious, and no more called for supernatural interference than the chemical combinations continually taking place round about us. I think I cannot do better than give a few quotations from " Evolution and the Origin of Life," by Professor H. C. Bastian, of University College, London, England. He very clearly states the case from an evolutionist point of view, and as clearly gives the reasons why he believes the general theory to be true. I can only give short quotations here and there, which you all know cannot do justice to any writer. In defining what the word implies he says: " Evolution implies continuity and uniformity. It teaches us to look upon events of all kinds as the products of continuously operating causes; it recognizes no sudden breaks or causeless stoppages in the sequence of natural phenomena. It equally implies that natural events do not vary spontaneously. It seeks to assure us that the properties and tendencies now manifest in our surrounding world of things are in all respects similar to those which existed in the past. Without a basis of this kind Evolution would be a mere idle dream." An examination of the facts of science generally, and of various every day phenomena, teaches us, according to the evolutionist, that matter of different kinds, situated as it is and has been, gradually tends within certain limits to become more and more complex in its internal and external constitution, Coupling this conclusion with various astronomical data, and with facts derived from the study of past forms of life upon the globe, the evolutionist attempts to penetrate through the long vista of bygone ages till he may rest his speculative gaze upon a vast rotating nebular mass of gaseous matter from which he supposes our universe to have been slowly evolved; assuming that our planet had a past history of this kind, he must also assume that it rapidly changed from a gaseous to a fluid state before beginning to solidify by the formation of a superficial crust, which gradually thickened as the fervent heat of it radiated into space. Until this stage of the earth's history had been far advanced no living thing could have existed upon its surface. Living things must, however, have appeared upon its surface at some very remote epoch, since their remains are to be found far down in the rocks which at present constitute its crust. How, therefore, it may be asked, is the first appearance of life on this earth to be accounted for?

We should not invoke an unknown act of creative power unless more ordinary natural causes fail, and it really be found necessary to invent some such a hypothesis. Now, the thorough-going evolutionist repudiates the notion of creation in its ordinary sense. He believes that the operation of natural causes working in their accustomed manner were quite adequate to bring into existence a kind of matter presenting a new order of complexity and displaying the phenomena we call life. Living matter is thus supposed to have come into being by the further operations under new conditions of the same agencies as had previously led to the various inorganic constituents of the earth's crust—such mineral and saline substances as we see around us at the present day, so that in accordance with this view we have no more reason to postulate a miraculous interference or exercise of creative power to account for the evolution of living matter in any suitable portion of the universe, whether on this earth or elsewhere, than to explain the appearance of any other kind of matter. The question might be asked whether life still continues to come into existence from inert or lifeless matter? Herbert Spencer, the great apostle of evolution, sees no reason why it may not do so. Professor Bastian, and a good many others, maintain that it really does so, as proven by a series of experiments extending over a lengthened period. He contends that all the conditions of matter necessary to the beginnings of life still exist, and that new life is continually being evolved. Professor Huxley is quite in agreement with Spencer and Bastian as to the beginning of life, but appears to think that existing conditions of matter on the earth's surface are not favorable to new beginnings of life. Dr. A. Wilson sums up the question in the following words: "Although research has not as yet finally placed the puzzle of life and its solution at our feet, our inquiries have at least served to indicate the direction towards which modern scientific faith is slowly but surely tending. The search after a material cause for phenomena formerly regarded as thoroughly occult or supernatural in origin, is not a feature limited to life science alone. Such a characteristic of modern research indicates with sufficient clearness the fact that, as biology and physics become more intimately connected, the explanations of the phenomena of life will rest more and more upon a purely physical and appreciable basis. That life had a distinct beginning upon the earth's surface is proved by astronomical and geological deductions. That life appeared on this world's surface, not in its present fulness, but in an order leading from simple forms to those of an ever increasing complexity, is an inference which geology proves, and which the study of animal and plant development fully supports.

That the first traces of life existed in the form of protoplasmic germs, represented to-day by the lowest of animal and plant forms, or rather by those organisms occupying the debatable territory between the animal and plant worlds, is well nigh as warrantable a supposition as any of the preceding. And last of all, that these first traces of protoplasm were formed by the intercalation of new combinations of the matter and force already and previously existing in the universe is no mere unsupported speculation, but one to which chemistry and physics lend a willing countenance. Living beings depend on the outer world for the means of subsistence to-day. Is it more wonderful or less logical to conceive that at the beginning the living worlds derived their substance and energy wholly from the same source? The common origin of animal and vegetable life, and the further unity of nature involved in the idea that the living worlds are in reality the outcome of the lifeless past, constitute thoughts which leave no break in the harmony of creation."

A few words on the origin of species, as very generally accepted in the scientific world, may not be without interest. I can only give a meagre outline of the general principles :—

"A few great naturalists, previous to the time of Darwin, struck by the very slight differences between many species of animals, and the numerous links existing between the different forms, and also observing that a great many species do vary considerably in their form, color and habits, conceived the idea that they all might be produced one from the other. The most distinguished of these writers was the great French naturalist Lamarck, who published an elaborate work, "Philosophie Zoologique," in which he endeavored to prove that all animals whatever are descended from other species of animals. He attributed the change of species chiefly to the effect of changes in the condition of life, such as climate, food, etc., and especially to the desires and efforts of the animals themselves to improve their condition, leading to a modification of form or size in certain parts, owing to the well-known physiological law that all organs are strengthened by constant use, while they are weakened or completely lost by disuse. The arguments of Lamarck did not, however, satisfy naturalists, although a few adopted the view that closely allied species had descended from each other. The general belief of the educated public was that each species was a "special creation" quite independent of all others, while the great body of naturalists equally held that the change from one species to another, by every known law or cause, was impossible, and that the "origin of species" was an unsolved and probably an insoluble problem.

The only other important work dealing with the question was the celebrated "Vestiges of Creation," written by the late R. Chambers, of the great publishing firm of W. & R. Chambers, of Edinburgh. In this work the action of general laws was traced throughout the universe as a system of growth and development, and it was argued that the various species of plants and animals had been produced in orderly succession from each other by the action of unknown laws of development aided by the action of external conditions. But no great change of opinion was effected among naturalists until after the publication of the "Origin of Species" in 1858 by Charles Darwin. There was then no question of the origin of families, orders and classes, because the very first step of all was believed to be an insoluble problem. But this is now all changed. The whole scientific and literary world, even the whole educated public, accepts as a matter of common knowledge the origin of species from other allied species by the ordinary process of natural birth, the idea of special creation being all but extinct.

A summary of the Darwinian theory of the origin of species by Alfred Russel Wallace, is as follows :—" The theory of natural selection rests on two main classes of facts which apply to all organized beings without exception, and which thus take rank as fundamental principles or laws. The first is the power of rapid multiplication in a geometrical progression; the second, that the offspring always vary slightly from their parents, though generally very closely resembling them. From the first fact or law there follows necessarily a constant struggle for existence, because while the offspring always exceed the parents in number, generally to an enormous extent, yet the total number of living organisms in the world does not and cannot increase year by year, consequently every year, on the average, as many die as are born, plants as well as animals; and the majority die premature deaths. They kill each other in a thousand different ways; they starve each other by some consuming the food that others want; they are destroyed largely by the powers of nature—by cold, by heat, by rain and storm, by flood and fire. There is a perpetual struggle among them, which shall live and which shall die; and this struggle is tremendously severe because so few can possibly remain alive—one in five, one in ten, often only one in a hundred or even a thousand.

" Then comes the question, Why do some live rather than others? If all the individuals of each species were exactly alike in every respect, we could only say it is a matter of chance. But they are not alike. We find that they vary in many different ways. Some are stronger, some swifter, some hardier in constitution, some more cunning. An obscure color may render concealment more easy for some. Keen sight may enable others to discover prey, or escape from an enemy better than their fellows. Among plants the smallest differences may be useful or the reverse. The earliest and strongest shoots may escape the slug; their greater vigor may enable them to flower and seed in unfavorable weather; plants best armed with spines or hairs may escape being devoured; those whose flowers are most conspicuous may be soonest fertilized by insects. We cannot doubt that, on the whole, any beneficial variation will give the possessors of it a greater probability of living through the tremendous ordeal they have to undergo. There may be something left to what may be called chance, but on the whole "*the fittest will survive.*" Then we have another important fact to consider,—the principle of heredity or transmission of variations. If we grow plants from seed or breed any kind of animals, year after year, consuming or giving away all the increase we do not wish to keep just as they come to our hand, our plants and animals will continue much the same; but if we every year carefully save the best seed to sow, and the finest or brightest colored animals to breed from, we shall soon find that an improvement will take place, and that the average quality of our stock will be raised. This is the way in which all our fine garden fruits and vegetables and flowers have been produced, as well as our splendid breeds of domestic animals; and they have thus become, in many cases, so different from the wild races from which they originally sprung as to be hardly recognizable as the same. It is, therefore, proved that if any particular kind of variation is preserved and bred from, the variation itself goes on increasing in amount to an enormous extent, and the bearing of this on the origin of species is most important; for if in each generation of a given animal or plant the fittest survive to continue the breed, then whatever may be the peculiarity that causes fitness in the particular case that peculiarity will go on increasing and strengthening so long *as it is useful to the species.* But as soon as it has reached its maximum of usefulness, and some other qualification or modification would help in the struggle, then the individuals which vary in the new direction will survive; and thus a species may be gradually modified, first in one direction and then in another, till it differs from the original parent form as much as the greyhound differs from any wild dog or the cauliflower from any wild plant. But animals or plants which thus differ in a state of nature are always classed as distinct species, and thus we see how by the continuous survival of the fittest, or the preservation of favored races in the struggle for life, new species may be originated. Past time has been to all intents and purposes infinite. Hence it is probable that the existent species of animals and plants have been evolved through natural selection acting through long periods of time from a few primitive and simple forms of life."

It will be observed that Mr. Darwin does not attach much weight to environment as a great agent or factor in the origin or modification of species. Other naturalists of eminence differ from Mr. Darwin in this respect, and maintain that the influence of surrounding physical conditions, as held by Lamarck, is quite as potent a factor as natural selection, in bringing about the changes which are ever taking place in the structure of organic life. It has often been observed that when certain kinds of animals change their habitat, organs that cease to be useful gradually disappear, while new organs or adaptations of already existing ones to changed habitat as surely come about. In the January number of the *Popular Science Monthly* there is published an article by A. S. Packard, whom most of you have heard about, on the effect of cave life on animals, in which he shows most conclusively that gradual loss of the organs of sight occurs to animals so situated, and that modification of other organs takes place, such as the lengthening of the antennæ or feelers, etc.,—that is, the sense of touch becomes greater as the necessities of the conditions demand its use. In such cases as these Dr. Packard thinks there is little room for the operation of natural selection, and that it plays a very subordinate part in the set of causes inducing the origin of these forms. I will not attempt to state the evidences which have been advanced by scientists to prove the relationship and unity of organic life as manifested by embryology, by rudimentary organs found in many animals for which now there is apparently no use, and by the fossil remains of animals now extinct but showing close affinity to those now living, but will only say in conclusion that the longer anatomical and geological investigations continue, the more surely does it appear that all animated beings began their life course in the form ot a simple cell, and that by a long process of evolution they have come to be differentiated into the numberless forms in which we now find them, all tied together by an endless chain without even one missing link.

MONDAY AFTERNOON POPULAR LECTURES.

CONCHOLOGY.

By Rev. G. W. Taylor.

(Delivered March 10th, 1890.)

After some preliminary remarks concerning the scope of the study of Conchology and the best way to make a collection of shells, the lecturer proceeded to give an outline sketch of the classification of the Mollusca. He showed that they are divided into four large divisions, in accordance with the form and position of their organs of progression. These divisions are—

I. CEPHALOPODA, as the Nautilus and Squid, which have their feet grouped around the head.

II. GASTEROPODA, or stomach-footed, as the common snail which progresses by the regular movement of the muscles of the ventral surface.

III. SCAPHOPODA, or boat-footed, a very small order containing only the *Dentalia* or Tooth Shells and their allies.

IV. PELECYPODA, or axe-footed Mollusca. This order contains all the bivalves, such as oysters, clams, mussels, etc.

Under each of the heads an account was given of the anatomy, geological age and present distribution of some of the better known species, and attention was drawn to the importance of studying the animal of the different shells.

Before closing his interesting lecture Mr. Taylor went on to speak of the way in which the study of the variations of species in the mollusca brought the conchologist face to face with the great theories of evolution and development. He said:—" A paper on evolution was read before this Club a week or two ago and in the discussion that followed, a remark fell from one of the speakers concerning the *conflict* between evolution and theology. Now, as I know, that there are many of you who would hesitate to accept evolution, if at variance with theology, while there are others, perhaps, who would eagerly throw overboard their theology, if apparently contradicted by evolution. I think that it may be useful to state the opinion on these matters of one who has studied, and who conscientiously accepts the teachings of both theology and science.

Science, of course, should be primarily an independent study. Scientists have no time and little inclination usually to study theology, and neither have theologians, as a rule, the opportunities to become masters of science. When science has demonstrated a *fact* there can be no gainsaying it; it will over-ride any theological dogma; but a scientific *theory* does nothing of the kind. For instance science has *proved* that our world was not made in six days of 24 hours, as it used to be believed, and theologians accept the *fact* and find it in no way inconsistent with their Bible.

Science has *proved* that evolution has taken place, and is taking place, in both the animal and vegetable world, and theologians accept these facts also.

But science has *not yet proved* that evolution is the cause of *all* the various forms of life we have to-day, and it has *not yet proved*, and I am confident never can prove, that any life can originate *of itself*. Let it prove even the former of these propositions, let it trace back every animal and vegetable to one original speck of protoplasm, and even then science will not do away with the necessity of a creator."

Mr. Taylor went on to explain how Dr. Bastian's theory of abiogenesis had been completely upset by the experiments of Prof. Tyndall, and then said: You will see therefore that there is no necessary conflict between the theory of evolution and theology. Both parties (the theologians and the scientists) are often rather unreasonable. Theologians have sometimes been tempted I know to dogmatise unnecessarily, but on the other hand scientific men are constantly asking them to swallow pounds of theory with every few grains of fact. I for one am ready to accept the facts, and I believe that the principles of evolution have been conclusively proved, but I do not feel called upon to accept at present all the extravagant theories that the more extreme disciples of Darwinism have put forward.

In conclusion, my excuse for introducing this subject into an address on conchology must be the fact that from this science evolutionists have drawn some of their strongest arguments, while in it also they have met with some of their greatest difficulties.

BOOK NOTICES.

Several pamphlets have been sent to the editor, which will be noticed as space and occasion permit. The following will be of interest to fruit-growers :—

"The composition of Apple-tree Leaves" by F. T. Shutt, M.A., F.I.C., F.C.S., Chemist to the Dominion Experimental Farms. The above is the title of a useful paper, the separates of which have just been distributed, that was read by Mr. Shutt before the convention of fruit-growers of the Dominion, held at Ottawa in February last. The work was undertaken with the object of suggesting a rational method for the application of fertilizers to apple orchards. Analyses are given of the leaves of five of the best known varieties, at two different stages of growth—on 25th May when the leaves were just unfolded and on 20th September when they had fully matured. The results are given in tabular form, arranaged under the following heads :—i. Composition of Leaf, showing the percentages of moisture, organic matter and ash. ii. Percentage composition of important constituents in Ash, giving the amount of phosphoric acid, potash, lime, magnesia, oxide of iron and silica. iii. Nitrogen in Organic matter. iv. Weight of Fertilizing Constituents in 1,000 lbs. of Leaves, namely, Nitrogen, Phosphoric Acid and Potash.

From the data in the above table we ascertain the extent to which the soil is exhausted by the apple-tree as regards its leaves. This is valuable knowledge. We are told that Mr. Shutt intends to make a complete series of analyses of the apple tree in which the old and young wood as well as the fruit will be included. We shall then have definite knowledge by which the fruit grower will be able to obtain the best results, and will be able to carry on his operations with precision and without doubt as to the results. Below are Mr. Shutt's conclusions, founded upon his scientific investigation, and it will be seen that they coincide exactly with the results which have been arrived at by practical orchardists after many years of experience and trial, with the important difference that the scientific man knows that his results must be accurate, while the man who has only his practical experience to back him only thinks he is right without knowing the reason why :—

"Phosphoric acid, potash and nitrogen are the three constituents which above all others must be put back into the soil if we are to preserve its fertility. Plants of certain orders require more of one or other of these than plants of other orders. Some soils are specially rich or poor in one or more of the materials, and consequently in the rational mode of application of fertilizers much intelligence and patience must be exercised.

That the leaves of the apple trees draw a large amount of food from the soil annually, has been shown. This must be replaced in excess for the vigourous growth of the tree. The leaves of the tree play no unimportant part—respiration and digestion are their two chief functions—which, if they do not perform well, the tree cannot live and bring to perfection its fruit. Therefore, when we feed the leaves we are indirectly feeding the fruit.

The results of this work seem to point in the direction of mineral fertilizers, and specially of potash, as being more particularly required for the growth of the leaves, and, therefore, for the vigorous development of the tree, including an abundant crop of fruit.

A heavy dressing of wood ashes (which may be procured in many parts of Canada at a very low price) or of kainit or other form of potash is, therefore, to be recommended for orchards.

The value of the leaves composted—a process to be advised as more economical than burning—is also well established by the data afforded by this work."

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LIBRARIAN'S REPORT 1889-90.

To the Council of the Ottawa Field Naturalists' Club :—

GENTLEMEN,—I have the honour to report that, as soon as possible after taking office as your librarian, I collected the books and periodicals forming the library of the Club, as well as the back numbers of the Club publications, from those of my predecessors who still had them in their keeping. Through the kindness of the Custodian of the Ottawa Literary and Scientific Society, I have been able to find storage room for these in the lecture room of the society. This has enabled me, to a certain extent, to classify and arrange them, and to prepare in rough form a catalogue, which I regret exceedingly lack of time has compelled me to leave in that form, but which, with the permission of my successor, I shall revise and copy before handing it over to him. In making the catalogue I found that almost all the sets of back numbers of exchanges were incomplete, but on receiving authority for that purpose from the Council, I exchanged missing back numbers with such of our exchanges as were willing to do so, and they were nearly all so willing. The result is that, at a slight extra expenditure for postage, the sets are now in most cases complete, as far as the missing numbers can be had in print. Four exchanges have been added to our list during the year, viz. :—*The Royal Swedish Academy of Science*, Stockholm ; *The American Geologist*, Minneapolis, Minn. ; *The Wisconsin Academg of Science*, Madison, Wis. , and *The Nautilus*, Philadelphia, Pa. It is a matter for congratulation that we have been able to appropriate the sum of $8.40 for binding. With this I have have had bound twelve volumes of convenient size, containing in all eighteen volumes of periodicals, as follows :—*The Auk*, 6 Vols. ; *Bulletin of the Torrey Botanical Club*, 8 Vols., bound in 3 ; *Proceedings of the Boston Societg of Natural History*, 1 Vol. ; *Transactions of the O. F. N. C.*, 1 Vol. ; *The Ottawa Naturalist*, 2 Vols. bound in 1. The fact that several of these have already been borrowed by members, indicates the desirability of pushing on the work of binding as fast as our resources will from time to time permit. It is also desirable that when we move to other quarters, as I believe we soon must, larger and more suitable accommodation should be provided for our books, many of which are extremely valuable. A list of the publications received as donations and exchanges during the year appears in the number of the NATURALIST issued to-day.

Respectfully submitted,

WM. A. D. LEES, Librarian.

Ottawa, March 14th, 1890.

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WINTER SOIREES.

The Soiree Committee requests such members of the Club as are willing to read papers during the coming winter to send in to the Secretary, as soon as possible, the titles, and at the same time to indicate approximately the date when they prefer to present them.

A BIRD IN THE BUSH.

[By W. A. D. Lees.—Read February 1890.]

The old saw about a bird in the hand, like many another old saw, needs some filing down to make it cut true. Applied literally to birds, it may appeal by its aptness to the sportsman or the working ornithologist, but to one who does not aspire to the honours of either position, but is a simple lover of birds in their native haunts, its truth will not be so apparent. I shall not stop to discuss the question of man's inherent right to slay his fellow-creatures at pleasure, or even of the expediency of so doing for useful purposes, scientific or gastronomic. I merely wish to record, in passing, my humble opinion that there is much unnecessary slaughter of birds by amateur ornithologists and others; and then to show, by a few anecdotes of bird ways from personal observation, that not a little of interest, and perhaps something of value, may be learned of the habits of these interesting creatures, without the aid of a gun. If in so doing I am fortunate enough to enlist in the ranks of the observers one recruit who has hitherto held aloof, through his aversion to killing, I shall be satisfied that I am not altogether on the wrong track. It is just about two years since I began to observe birds with any care, and when I tell you that at that time I knew barely fifty species and of many of these I had very hazy ideas, though I had lived in their midst for twenty-five years, you will be inclined to ask me where I kept my eyes all that time. It is a question I have asked myself a thousand times, but as yet I have received no answer.

One of my first finds was a flock of Pine Siskins, which I surprised feeding in a clump of cedars in February. It was a beautiful still, bright day, an ideal day for a snowshoe tramp, which I had been enjoying to the full, when I reached this bit of cedar swamp and stopped to reconnoitre. I had not waited long when I heard the contented trilling chirp of the feeding birds, and followed the sound till I came upon them busily picking out and devouring the seeds of the cedar, and scattering the husks broadcast upon the snow. I immediately levelled my double-barrelled fowling piece (a field glass) upon them, and as this did not seem to disturb them in the least, I gradually moved towards them until I was so near that I could easily distinguish the yellow markings of the feathers, and get a pretty fair mental picture of the bird for comparison with the description which, after some research, I found in my "McIlwraith." I have dwelt somewhat at length upon this as being a very fair sample of the way in which I identified the one hundred and twenty species of birds I have now the pleasure of numbering amongst my acquaintances. This number I am aware is a small showing for two years' work, but as yet I have had but little opportunity to visit the haunts of the water birds. Of course I varied my plans to suit the circumstances, and when the birds seemed unwilling to have me go to them, I reversed Mahomet's plan with the mountain and sat down and waited till the birds came to me. If many a time I got tantalizing glimpses for a moment only of some new or rare bird, which tempted me to regret my lack of a gun, there were few instances in which I was not afterwards rewarded by a longer and nearer view of the same bird, which enabled me to identify it, at least to my own satisfaction. Besides, I always consoled myself with the reflection that the noise of a gun would have driven away more birds than its use would have secured. Having thus outlined my plan of campaign, it remains to give you the promised anecdotes of bird ways, though I cannot reasonably hope that my observations will interest you as they did me, to whom everything I saw was a new revelation.

One of the first things that struck me about the birds was a very human quality in many of their actions, and strange to say it was not always the noblest traits of man they chose for imitation. For instance my admiration for the stronger sex was not much increased by watching the actions of a Downy Woodpecker, who would not respond to his wife's frenzied entreaties for help in driving from their door a big, able-bodied tramp of a Flicker who insisted on getting in. There sat Mr. Downy in a neighbouring tree, and would not stir a wing, though his better half even left the door unguarded for a moment, and went to fetch him, but when the intruder was driven away by my rapping on the the trunk of the tree with a stick, he came swaggering home, and took all the credit of it to himself. It was only when he was thus shamelessly boasting of his prowess that I noticed the scarlet fez he wore on the back of his head, and reflected that one could expect no better of a Turk. This seems to have been a bad neighbourhood to live in, for, a month or so later, when the downies had moved out and rented their cottage to that trim little housewife Jenny Wren, she, too, got into trouble with a couple of marauding English Sparrows, who forced an entrance and destroyed everything eatable in the house. The neighbours all gathered round and chirped their sympathy in loud and distressed voices. There were the gaily dressed Yellow Warblers, and Goldfinches, the Cedar Waxwings in their olive-brown silks with the yellow trimmings, a lone Catbird in his sober slate-coloured coat, and even a tiny Ruby-throat came buzzing along and perched on a dead twig to see what was the matter. All agreed that it was dreadful, but that it really could not be helped, and besides it was none of their business. Even landlord Downy when he arrived could not make up his mind that he would be strictly within his legal rights in using that murderous looking dagger, which he always carries round with him, for the protection of his tenants, or the punishment of their assailants. Turning now to a pleasanter phase of this unconscious imitation of human traits, one of the most striking instances of affection between birds that have come under my notice was that displayed by a pair of Cedar Waxwings, or as they are sometimes called, Cherry-birds. It was at the time when the fruit was beginning to form on the trees, and one of them had picked up an apple about the size of a large pea and perching close beside his mate in an old apple tree, he passed it with a great display of politeness and affection to her, and she with an equally courtly and loving air returned it to him. This operation they repeated several times, till at last they caught sight of two interlopers who had been watching them, and being too bashful to continue their billing in public, they flew away. Burroughs I think cites a similar case with reference to the same bird.

Curiosity is another characteristic, many of the birds have in common with the human race. I remember being interviewed by a Water Thrush, while standing quite still in a swampy piece of woods, watching for another bird. This shy little warbler came hopping along from branch to branch till it was within two feet of my face, looked me full in the eyes, took a careful survey of me from head to foot and then, as if satisfied with the inspection, flew away.

What fixed this somewhat trival occurrence, in my mind, was that on the afternoon of the same day, in another swamp at least three miles from the first one, the very same thing was repeated by another Water Thrush, in almost exactly the same way. At another time one of a little knot of Meadowlarks I was scrutinizing with the glass, thought he would like to see what I looked like behind, so, making a long *detour*, he flew up as near as he dared behind me to have a look. By turning my head I followed his flight, and when he alighted and saw that I was still watching him, he hurried back by the way he came in a great state of excitement, and reported to his comrades that I could look both ways at once with my big goggle eyes. Of course they knewbetter and laughed at him.

Of all the birds, one would think the big blustering bully known as the Crow Blackbird, the least likely to imitate the acrobatic feats of human beings. And yet I was told by a young man, whose veracity up to that time I had had no reason to doubt, that he had a short time before witnessed the spectacle of several of these birds turning somersets on the grass. He further went on to say that one of them was as far superior to the others in acrobatic proficiency as the bespangled king of the circus arena is to the common tumblers in the pink tights. These less favored birds, he averred, made a dismal failure of it, or as he put it "fell all over themselves," whenever they tried to follow the leader in his graceful evolutions. I gravely listened to this touching narrative giving no hint of my mental resolve to enquire the price of yarn at the first opportunity, a resolve I never carried out, for just six days later I surprised two of these Blackbirds sitting on a pasture fence, acting in the double capacity of spectators and sentinels, at a similar acrobatic performance given by half a dozen of their cousins, the Cowbirds. They were not just exactly turning somersets, but their actions were sufficiently unbirdlike, and bore a strong enough resemblance to the tumbling of the circus ring, to make me very glad I had expressed no open doubt of my informant's truthfulness, and when I afterwards saw two Robins playing hide and seek over the shelving edge of a railway cutting, with all the dainty tip-toeing to the edge of the bank, the springing out from the hiding place, the screams, and the laughter, that would have characterized the game had it been played by children, I was still more ashamed of my unbelief. And now that I too have forfeited all claim to be believed I shall only ask you to listen to a few more of my bird yarns, selecting such as will not lay too great a strain on your imaginative powers.

It often puzzled me how birds did for water in winter when snow and ice covered almost all the available sources of supply, and open water was to be had in but few places. The most natural solution (in more senses than one) of the difficulty did not occur to me till I happened to observe a Goldfinch eating snow in February.

If I am not mistaken the tail, in its capacity of rudder, is generally supposed to be an indispensable part of a birds outfit, and I must confess to a similar opinion, held till August of last year, when I saw in broad daylight, and watched for some time, a Night Hawk so utterly devoid of tail that it seemed as if the after half of the body had been chopped off with it. And yet this bird was hawking for its daily meal of insects, among its brothers, and performing all those graceful aerial evolutions for which the species is noted, with apparently as much ease as any of them. I also read in the last number of the Ornithologist and Oologist, (one of our exchanges), of a Yellow-billed Cuckoo without a tail having been observed on its nest, and the question at once suggested itself, by what kind of accident are birds deprived of this useful appendage, or do these instances merely indicate the beginnings of a new phase of avian evolution, analogous to that by which man has attained his present tailless eminence?

Though birds in general conform more or less strictly to certain rules in the selection of their building materials, we occasionally find an individual who sets these rules at defiance, and displays the originality of a master mind in the selection. For instance a Robin's nest found in this vicinity a year or two ago embodied in its composition art, literature, finance, and the manufactures, art being represented by a skein of colored embroidery silk, literature by a newspaper clipping, finance by a cancelled cheque on the Bank of British North America, and a fragment of a promissory note, and the manufactures by a piece checked cotton shirting. It will be noticed that the builder showed great impartiality except perhaps, as above indicated, an undue preference for checks.

When we reach the last chapter in the life of a bird many perplexing questions arise. One of these is, what becomes of the large numbers of birds that must of necessity die from old age or other natural causes? Is it, as has been suggested, that on the approach of death they instinctively hide themselves from view, and thus concealed await their doom, or is it that they are at once removed from sight by nature's industrious scavengers, the insects and other animals? Whatever be the reason, the fact remains that comparatively few dead birds are found whose deaths cannot be traced to violence or accident. In the latter class of cases the inventions of man play an important part. Lighthouses, railways, and telegraph wires all contribute their quota to the large number of accidental deaths in the bird world. Many instances are reported of birds meeting their deaths by flying against moving railway trains, and last summer a black-billed Cuckoo was brought me which had been found dead upon the cowcatcher of the locomotive, on the arrival of the evening express from Montreal on the Canada Atlantic Railway. This bird was brought me by a bright-eyed and observant boy, who sometimes accompanies me on my tramps, evincing much intelligent interest in bird life. He tells me that last summer, while on an excursion train on the same railway, he saw a Crow fly against a wire fence, and, becoming entangled with one of the barbs, it hung there, struggling and fluttering as long as he could see it from the window of the moving train. Another curious instance was that of a Sparrow Hawk brought me last fall, which had been found in one of the flues of the boiler at Lansdowne Park, just before the Exhibition there last fall. The boiler had not been opened since the year before, and the poor creature had evidently, at some intervening time, flown down the smokestack, and, being unable to fly up again, had starved to death. What little flesh remained on its bones was completely dried up, and the plumage, except for a slight abrasion on the head, was in perfect condition, its colour, however, being slightly darkened with soot. I congratulated myself on having a ready-preserved specimen, but although it had been very dead when I got it, in less than forty-eight hours it was very much alive, and I speedily lost my faith in that method of embalming, and with it my specimen.

These are a few instances, taken somewhat at random, of what may be seen by any one who will use ordinary powers of observation, and if my hasty and imperfect account of them has interested any of you one half as much as the observations themselves interested me, I think you will be inclined to agree with me that, for some purpose at least, a bird in the bush is worth two in the hand.

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A NATURALIST IN THE GOLD RANGE, B. C.

By James M. Macoun.

(*Read March 7, 1890.*)

While the Gold Range proper includes the Selkirk, Purcell, and several other ranges of the Rocky Mountains, the term "Gold Range" is more frequently applied to that part of the system termed by geologists the Columbia Range. Lying between the N. E. arm of Shuswap Lake and the Canadian Pacific Railway is a group of mountains forming a part of this range, but to which no distinguishing name has yet been given; one of the mountains in this group, however, is known as Mount Queest, and I shall restrict myself to a brief account of an expedition made to it last summer in search of Natural History specimens. If my paper assume the form of a personal narrative it is only because I have thought it the best means of conveying impressions of the mountains and what is to be found on them, to those who have never been among them.

I was accompanied by one man, and late in July we left Sicamous, at the mouth of Eagle River, and rowing up the N. E. arm of Shuswap Lake camped, after a long day's pull, at the mouth of a small creek which we were to ascend the following day. Before sunrise we had packed a few pounds of bacon and flour in our blankets, and tying them securely on our backs, set out, my companion carrying a repeating shotgun and I a plant press well filled with papers. It was our intention to follow the creek to its source, and by doing so we hoped to reach a mass of snow almost due south of where we had camped. A well-defined path ran along the creek, and as we had heard that the plateau which formed the summit of the range was a favorite hunting ground of the Indians, we imagined that by following it we should be able to ascend the mountain with little difficulty. For perhaps a hundred yards the trail was broad and well worn, trees on all sides had been "blazed," and there was every evidence that it had been much used, but we then came suddenly upon an opening in the woods and found that our supposed mountain trail led only to an old camping ground where canoes had been made the previous year. Our disappointment was somewhat lessened by the discovery of a faint trail which still led up the creek, and although in many places it was imperceptible we had always two or three marked trees in sight before us, and had no difficulty in making fair progress, for while there were fallen logs and trees without number, our path wound in and out, over and under them, in such a manner that there were no obstructions to delay us; suddenly all traces of the trail were lost, nor were there markings of any kind upon the trees, After some time spent in a fruitless search for a continuation of the trail we concluded that we had been following an old line of traps; why it should have ended so abruptly we could not understand until having decided that trail or no trail we would push on, we looked about us and saw that the creek valley had been gradually narrowing, so that where we stood the bottom of the valley was not more than thirty yards across; the hills rose steeply on either hand, and on moving forward a short distance and rounding a "shoulder" of a hill that had before prevented us from seeing what was ahead, the reason for the sudden termination of the trail was evident. The valley had grown still narrower, or rather there was no longer any valley at all, the creek flowing through a canyon about half a mile in length, in which distance it fell several hundred feet. As we looked up the gorge we saw something darting in and out of the water, now disappearing behind a log or rock and again coming into view twenty or thirty yards off, it was a dipper, or water-ouzel (*Cinclus Mexicanus*). A pair at least of these wonderful little birds is to be found somewhere on every stream in the Gold Range, and yet it is nowhere common. Until mated it leads a life which, did the bird not always appear to be active and happy, would seem the essence of loneliness, for two of them are never seen together except in the breeding season. The splashing of swiftly-running water against logs and stones, or its roar as in little cascades it falls over obstructions to its course, is all the company the dipper asks, and all day long never resting, never wearying, it moves from place to place. It walks under water as if on dry land, and seems almost as much at home there as anywhere else; it knows of but one way of getting behind the waterfall, where perhaps it has built its nest, and that is to go straight through it. Its song is described as "exquisitely sweet and melodious," but although I have seen many of them I have never heard one sing.

We decided that we could follow the creek no further, and after a short rest began the ascent of the shoulder. As we left the low, dark woods of the creek valley a mountain chipmunk (*Tamias Asiaticus var. borealis*), the smallest of the squirrel family in America, ran chattering across a ledge of rock above us. This tiny animal possesses to the full the characteristic activity of its family and is seldom at rest; it is to be found everywhere in these mountains, and one soon grows to feel lonely when none happen to be near enough to make their presence known by their merry chatter. No more industrious animal is to be found anywhere; all through the last weeks of summer and the short autumnal days, before the first heavy fall of snow drives him into winter quarters, he is employed in gathering and storing away roots and seeds for use during the winter. With his fore feet he fills the pouches with which nature has provided him—one on either side of his mouth—and returning to his snug little home beneath some stump or fallen tree, packs his harvest away in his store-room, for not satisfied with making the chamber he is to occupy warm and comfortable with moss and leaves he stores his food in another apartment than that in which he is to doze and dream away the long winter.

After leaving the creek we forced our way through a dense growth of small fir trees and underbrush until we were out of the creek valley and about 500 feet above the water. We were now between two creeks and on a ridge that seemed to extend to the summit, and up this we toiled for three hours. The whole mountain side had a few years before this been burned over, and the second growth timber was as yet very small; the dense undergrowth effectually concealed the burnt logs with which the ground was strewn, and which could seldom be seen before they were stumbled against. Not a trace of water had been seen since we had forsaken the creek, and dinner without it was out of the question. We had seen no berries yet, but a little higher up found *Vaccinium parvifolium* in abundance. Its fruit, although refreshing, could be eaten in small quantities only, as at this altitude it was hardly ripe yet and far from sweet. By three o'clock we were both pretty tired, as we had not only been climbing steadily, but all our strength had to be exerted a great deal of the time to enable us to force our way through thickets of balsam or alder; and now we decided that water must be had even at the cost of losing some of the ground we had gained. We had been moving parallel to the creek, but had risen much more quickly than it, so that we were now nearly a thousand feet above it. Turning almost a right angle we began the descent, but so thickly grew the underbrush, and so many detours had to be made to avoid precipices, that it was five o'clock before we reached the water and found that we were just at the head of the canyon, half a mile from where we had been in the morning; supper was soon ready, and before dark we were quite rested. The canyon was now behind us, and we resolved that come what might we would not again leave the creek, nor did we, and although the road was far from smooth and there were rocks and logs in abundance to climb over, shortly after noon the following day we saw the snow glistening through the trees, and knew that we had not much further to go. A few rods higher the woods ended abruptly, and before us was a meadow (if a meadow may be formed of flowers instead of grass) reaching to the foot of the mountain two hundred yards away. This little flat is about one-fourth of a mile wide and two hundred yards deep at the centre, the hills rising from it in the form of a semicircle, so that the meadow made an arc of a circle, a veritable amphi theatre. Just at the edge of the woods our packs were thrown down, and we hurried across the intervening level ground to the foot of the last steep incline that led up to the snow, and had hardly begun to ascend it when we were startled by a sharp, clear whistle not unlike that used by yardmen about a railway station. Almost instantly it was answered from all sides, and we saw scampering toward an immense pile of rocks at the foot of a cliff, a dozen or more Hoary Marmots, or "whistlers," as they are generally called, (*Arctomys caligatus*.) Arrived at their own quarters, and imagining themselves in safety, they soon recovered from their surprise and fright, and as we climbed the hill we saw here and there above a rock a head apparently watching us. Soon the animals themselves appeared, and by degrees returned to the agreeable occupation of fattening themselves for the long hibernation of the coming winter. The whistling went on at intervals, but the note of fear was changed to one that savored ever so slightly of impudence. Our minds were now at rest. Here was food in plenty, and although we discovered afterwards that the flesh of the whistler is neither very tender nor very palatable, it was easily procured and furnished us with several good meals when nothing better had been shot; but at no other time did we attempt to take them. Only a few days before, the surrounding hills had been entirely covered with snow, but on many exposed places it had melted away and we ran up a grassy slope dotted with spring flowers. There was the beautiful Erythonium giganteum, a larger and much more handsome species than its brother the familiar Adder's Tongue or Dog-toothed Violet of our Ottawa woods, beside it grew Anemone occidentalis, the western mountain Anemone, a far larger and more attractive flower than any of our eastern forms of this genus. The little arctic buttercup Ranunculus Eschscholtzii was everywhere in profusion, and in the little rivulets running from the snow Epilobium alpinum grew in dense clumps, its delicate pink flowers massed together to attract attention. Claytonia Caroliniana, var. sessilifolia, was abundant too, but is not nearly so pretty as our Spring Beauty, of which it is a variety. Merely glancing at these as a foretaste of what was in store for us, we lost no time in climbing to the summit of the hill, which we soon reached, and from which we had a magnificent view of the surrounding country. Due north of us lay Shuswap Lake, and it was not difficult to trace with the eye the course of the creek from our feet to where it entered it. Far to the north and northeast were snow-capped mountains, and one glacier could be seen glittering in the sun. Towards the south the prospect was brighter. A mountain prairie, about three miles across, stretched from where we stood to a higher mountain. Further inland, a few groves of trees and frequent dashes of brilliant color, where the flowers of one species predominated, gave the whole an appearance of an im_ mense park, the innumerable rivulets and brooks defined by the deeper green of the grass that grew along them, appearing to be so many intersecting paths and heightening the effect of artificiality.

There seemed to be a great many species of flowers growing on this prairie, but a closer examination the next day showed that after all there were but three conspicuous species, the red blue and yellow blossoms of which blended in so many different ways and formed such novel combinations that it seemed incredible that there should not be at least a dozen species represented. Others indeed there were, but not such as formed noticeable patches of color, but the three colors in some form or other were everywhere. In one place could be seen many yards covered with Lupinus Nootkatensis, a common British Columbia lupine, but one could never tire of its spikes of beautiful blue flowers, which exhibit all the varying shades between the lightest caerulean and the deepest smalt blue. Again, it would be mixed with the bright scarlet flowers of Castilleia miniata, or those of the yellow Arnica. As a rule, however, while all three flowers were present one was generally sufficiently in excess of the others to give the impression that it alone was to be seen, but on turning the eyes a little to one side some other color filled them. As we turned to descend the hill a porcupine was seen walking slowly towards us along its crest, and my companion could not refrain from picking up a stick and giving chase. Beyond a slight increase in his speed, as he turned away, the animal gave no evidence of being in the least frightened or even aware of our presence. A blow from the stick ruffled his equanimity a little, but before he could show fight a second had fractured his skull and he was hauled in triumph down the hill to camp, for we had decided to camp just where we had left our packs, and at once set about making ourselves comfortable. A level spot was soon found; Bryanthus empetriformis, the nearest approach to heather we have in Canada, grew everywhere, and enough of it was soon pulled to make a bed. There was dry wood in abundance; the pot was soon boiling, and after a cup of tea we felt quite at home. We did not ascend to the summit again that night, but in the immediate vicinity of the camp forty species of plants were collected before dark; many of them were small and of little interest to any but a botanist, but there were among them flowers that would have added to the beauty of any garden, Mimulus Lewisii, the Western monkey-flower, being one of the most conspicuous. To my mind none of the species in ordinary cultivation are at all to be compared with it. On a ledge of rock grew a solitary clump of Epilobium latifolium, but its dwarf habit and larger flowers make it much more attractive than its weed-like brother E. spicatum which grew near it. Beside and in every rivulet grew Caltha leptosepala, in general appearance not at all like Caltha palustris, the marsh marigold or cowslip of the East; the flowers are bluish-white instead of yellow, and the whole plant is much smaller than Caltha palustris. The porcupine was the largest animal seen while we were on this mountain, although there must have been caribou, bear, deer and mountain goats in considerable numbers, as fresh tracks were seen every day, but we never caught a glimpse of the animals themselves.

Besides the locality near our camp which I have mentioned, colonies of the Hoary Marmot were found in many other places; with them were frequently Parry's Spermophile *(Spermophylus empetra)* and the Little Chief Hare *(Lagomys princeps)*, although the spermophile preferred more open ground in which it could burrow easily. It is one of the largest of the ground squirrels, and was our principal food while on the mountain; we found its flesh to be delicate in flavour, tender, and much to be preferred to that of the marmot. The Little Chief Hare is an exceedingly interesting animal, and much has yet to be learned of its habits. Very little larger than the common rat, it is a typical hare in appearance as well as structure, with many of the habits of the common hare of Eastern Canada. Small and much the colour of the rocks which it frequents, it is seldom seen except when it attracts attention by its sharp whistle, and as the whistle is generally given just as it dives into a safe place among the rocks, specimens are not as a rule easy to procure. They are said to hibernate in nests made of moss, dried leaves and similar material, but it is hard to believe that so much time is spent in the careful cutting and drying of leaves that are to be used in the composition of a nest and not for food, when everywhere about are dried leaves of all sorts and sizes, and in sufficient quantity to furnish homes for all the animals that frequent the place; but it is said that they eat nothing when in winter quarters.

Certain it is that in early autumn the industrious little creature sets to work, and much of its time is spent in cutting and piling up leaves which it conveys to some hole among broken rocks, that has been chosen for the winter.

Three species of trees grew about our camp, all conifers : a spruce, Picea Engelmani; a hemlock, Tsuga Mertensiana; and a balsam, Abies sub-alpina; none of them were of large size, but although we were camped within a few hundred feet of the snow, they were almost as large as the same species had been a thousand feet below. No fruit of any kind was found at the altitude of our camp, but about a mile lower down the mountain Vaccinium myrtilloides and Vaccinium ovalifolium formed in many places the principal undergrowth; the berries of the latter resemble our common blueberries in appearance, but are much more acid, and not valued highly when other fruit is to be had. Vaccinium myrtilloides is unequalled among Canadian wild fruits; its berries are large, about half the size of the cultivated black cherry, which it exactly resembles in colour, the flavour is exquisite, and it possesses the rare quality of leaving no feeling of satiety, no matter how many of them may be eaten.

Of small birds there were about a dozen species on the mountain, several of them forms of common occurrence in Eastern Canada; the pine siskin *(Spinus pinus)* and white-winged cross-bill *(Loxia leucoptera)* were flocking together, the rasping note of the red breasted nuthatch and the assertive call of the kinglet *(Regulus calendulus)* were frequently heard, several little winter wrens sang continually behind our camp, and a family of mountain blue-birds *(Sialia arctica)* occupied a hollow tree near us. Although we were camped at an altitude of more than 6000 feet the rufous-backed humming bird *(Trochilus rufus)* was almost as common as it had been at the coast. Of game birds but two species were shot, the blue or sooty grouse *(Dendragopus obscurus fuliginosus)* and the rock ptarmigan *(Lagopus rupestris)*; the former is a common bird throughout Western British Columbia, and we had counted upon shooting as many of them as we should need for food; the ptarmigan is found only on the summits of high mountains, generally near the snow.

The descent of the mountain was not so difficult as disagreeable, for we now knew the best way to go and did not leave the creek valley except at the canyon, and there by climbing a few hundred feet the steep rocks were avoided; the great trouble was to move slowly enough, for in four hours after we had left our camp on the mountain, scratched and torn we had reached our boat at the lake.

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EXCURSIONS.

The excursions held by the Club during the past season have been remarkably successful in every way. In addition to the general excursions sub-excursions have also been made under the guidance of the leaders upon the Saturday afternoons throughout the summer. These will be mentioned in the Annual Reports of the Branches.

Excursion No. 1.—May 31, 1890.—A most successful field-day was held to Butternut Grove, in the Chelsea Mountains, as the first General Excursion of the Club. The locality was a new one, and proved to be all that could be desired. The members and their friends, to the number of 130 availed themselves of this opportunity to spend a pleasant and instructive day in the woods. The weather was simply perfect, and the interest shewn by all was a guarantee of the thorough enjoyment which everyone shared. At 4 o'clock the genial and popular President, Dr. R. W. Ells, having called the party together beneath the refreshing shade of a grove of beech trees, congratulated all present upon the complete success of the day; he then asked the leaders to speak of the various treasures collected in their several branches during the Excursion. Mr. Fletcher was first called upon; he spoke of the rarer and more interesting plants. Mr. Kingston, who followed him with observations upon birds seen during the day, found an attentive and eager audience. Mr. T. J. MacLaughlin, when speaking of the insects which had been taken, made an eloquent addresss and touched upon some of the points of the theory of development as illustrated in the insect world. Mr. H. M. Ami explained concisely the geological formation of the district, and was followed on the same subject by Prof. Bailey, F.R.S.C., of the University of New Brunswick, and also a member of the Club, who expressed his pleasure at being able to attend one of the excursions of the Club, of which he had often read accounts. At the invitation of the President, Mr. Horace T. Martin, of the Montreal Natural History Society, addressed the meeting. He spoke in high terms of the systematic manner in which the Excursion had been arranged, and the way in which the work was divided up under the leadership of specialists in the different branches of Natural History. He had enjoyed his day with the Ottawa Field Naturalists' Club very much indeed, and hoped that at the annual excursion of the Montreal Natural History Society, which was to be held the next Saturday at Lachute, he might have the pleasure of meeting many of those present. Miss E. Bolton, a member of the Council of the Club, spoke a few words, at the request of the President, upon the benefits of the Club as an educational institution. She spoke in a most encouraging way of the good the Club was doing amongst the young at the public schools of the city by drawing their attention to the good and beautiful.

The benefit to the Club of having ladies on the Council was plainly seen at this and subsequent excursions during the summer.

Excursion to Lachute.—June 7.—In response to an invitation from the Montreal Natural History Society, 17 members of the Club, including the President and several ladies, attended the excursion of that Society at Lachute. The Ottawa contingent arrived first, and received the Montreal club at the station on their arrival. A pleasant day was spent, and many interesting Natural History specimens were collected. Mr. Ami was asked to act as judge of the geological collections and Mr. Fletcher performed the same office for the botanical collections. The President, Dr. Ells, expressed the pleasure that he and his companions from Ottawa had experienced in meeting their Montreal friends, and trusted that there might be frequent similar joint excursions in the future. Mr. Whiteaves being asked to speak of the geology, said that Lachute was classic ground to the geologist, and told how Sir William Logan visited the place at a very early period of his career as Canadian Geologist, in a canoe, attended by four Caughnawaga Indians. How he had noticed the exposures of the calciferous and Potsdam formations in the neighbourhood of the Laurentian; and how he found the band of white crystalline limestone and traced it so many miles across the country. Short addresses were also given by Dean Carmichael, the Mayor of Lachute, and Professor Penhallow, who announced that in answer to the invitation of the Natural History Society, the Royal Society of Canada would hold their next meeting at Montreal. Votes of thanks were passed unanimously to the Mayor and people of Lachute, and cheers were given for the gentlemen who had addressed them and for the party from Ottawa. The company were invited to board the cars, where refreshments were provided through the kindness of the Canadian Pacific Railway Co.

WINTER SOIREES.

All members who wish to read papers or short notes for publication during the winter should send in the titles of their papers without further delay, as the programme for the winter is now being drawn up.

THE ENGLISH SPARROW.

By J. Ballantyne.

(*Read February 21st,* 1890.)

You are all aware that it is but a short time since the bird known by the name of "The English Sparrow" was introduced into North America, yet, notwithstanding this fact, it has increased in numbers so fast that it has now spread over nearly a third of the whole continent and is extending its area at the rate of about 275,000 square miles annually. It is highly probable that there are more of these sparrows at the present time in North America than of any single species of native bird. The presence of so many of them has become a question of such economic importance that the United States Department of Agriculture has issued a bulletin containing upwards of 400 closely printed pages relating wholly to the English Sparrow in North America, especially in its relation to agriculture. Attention to this bulletin has already been called in the last number of the OTTAWA NATURALIST. It deals with the whole question in a most exhaustive manner, entering fully into details concerning its introduction and diffusion, rate of increase and checks on the same. It also gives the replies from hundreds of observers from all parts of the country relating to the good and bad effects of sparrows on vegetation. Subsequently it points out the relation of sparrows to native birds, showing clearly that many of our insect-eating birds have been completely routed by the invaders. The conclusions arrived at by an overwhelming majority of observers are, that sparrows are more or less injurious to nearly all growing crops, including all our common fruits as well as grain and vegetables. and what little good they do would have been better done by our native birds had they not been driven away. The bulletin also gives an account of various methods which have been tried, in different localities, to destroy the sparrows, such as poisoning, trapping, shooting, etc. The methods most approved are pulling down their nests when this can be done, and persistent shooting. They become so wary that it is difficult to either trap or poison them.

Perhaps it may not be generally known that a great many colonies of sparrows have been introduced into the United States and Canada a considerable number direct from Europe, and a much greater number from their progeny in this country. The places and dates of the first importations, so far as known, are as follows :—

Brooklyn, N.Y., 1851-52 ; Portland, Maine, 1854-58 ; Peace Dale, Rhode Island, 1858 ; Boston, 1858-1868 ; New York City, 1860 ; Philadelphia, 1869, and not long afterwards into nearly every State of the Union. In Canada they were first introduced at Quebec in 1864, Montreal 1870, Ottawa the same year, Hamilton 1872, Toronto 1875, Halifax 1875-76.

The English or House Sparrow (*Passer domesticus*) is common over nearly the whole of Europe, the northern parts of Africa, and a large part of Asia. It has also been introduced into New Zealand and Australia, and has become, like the rabbits, a great pest in those countries. It is known to have been quite common in eastern countries before the beginning of the Christian era. Aristotle mentions it as being a common bird in Greece in his day. Dr. Charles Pickering, of Boston, states that in hieroglyphic times the picture of a sparrow indicated an enemy or one ready to fight. I think most of you who are at all familiar with the habits and disposition of their latter day descendants will agree with me that they are no unworthy sons of their ancient pugnacious sires. In an old and highly venerated book, which some of you may occasionally see, it is stated that the current price of sparrows some two thousand years ago or thereabouts was two for one farthing, a pretty sure indication that sparrows were either very plentiful at that time and place or that farthings had a higher commercial value than they now have.

As has already been stated the consensus of opinion among observers, regarding the habits and food of sparrows, is unmistakably against them so far as agricultural pursuits are concerned, and the verdict has gone forth that it would be better if they were made to go. Accepting this dictum as final, the question naturally enough arises, can they be made to obey ? It has been said by some that they could "call spirits from the vasty deep," but the reply to the question, " Will they come ?" has never been satisfactorily answered ; so it may be with our little fellow-emigrants. The question of their going may not be very easily answered. It seems to me that the advent of the people of Europe on this continent is almost a complete parallel to that of the sparrows. When they first came to this country they were heartily welcomed by the then occupiers of the land, but it was not long before the avarice, greed and cruelty of the strangers caused them to change their minds, and the word went forth among the dusky nations that the white man must go. We all know where he is now to be found, but where is the red man? So it may be with the sparrow. It came, or rather was brought, as the welcome ally of the husbandman. It has outlived the welcome, but it is still here in ever-increasing numbers, and, like its human prototype, it has probably come to stay.

One of England's greatest men in the world of science, but recently deceased, makes the statement that the power of adaptation to surroundings, means the survival and extension of both plants and animals so conditioned. The proofs of the truth of this statement are abundantly manifest, and perhaps no more striking instance can be given than the rapid increase and spread of the House Sparrow in this country. It appears to be possessed of the power of accommodating itself to climatic conditions in a higher degree than most of our native birds, and the varied range of food on which it can subsist and thrive fits it in an eminent degree to become a citizen of the world.

The sparrow, in providing for the rearing of its young, takes great precautions in the way of securing dry and warm quarters for them; from the care exercised in this respect there are reasons for believing that an unusually large proportion of their eggs produce young. It may also account in some manner for their great fecundity. The drain on the system incident to maternity being reduced to a minimum on account of their nests being always thickly lined with feathers and non-conducting materials, so that the time required to keep the eggs constantly warm during the period of incubation, must be shorter than it would be when the construction of the nest was of a different character. The fact that sparrows have from three to six broods in a season, varying from five to seven in each brood, while very few of our native birds have more than two broods, varying from four to seven in each, would confirm the belief that the drain on the vitality of the mother sparrow is less than it is with many of our native birds. Another proof that maternal duties do not affect the vitality of sparrows in a very great degree is the fact that occasionally there will be found in their nests, at one and the same time, new-laid eggs, eggs half hatched, and young birds. I have not seen this myself, but my friend, Mr. W. A. D. Lees, on the 30th May, 1883, took from a nest in the top of a young hemlock tree, built on the remains of an old robin's nest, two young birds just out, one half-hatched egg, and another fresh and good, apparently new laid. Whether a continuous succession of eggs and young birds ever extend over a whole breeding season remains, so far as I know, yet to be found out.

During the past fall, after the breeding season was over, several members of the club observed sparrows carrying feathers and other light materials to the nests occupied in summer, with the evident purpose of making them warm and better adapted to resist the severity of winter weather. In fact, it did not seem to be nest-building at all, but rather house-building, much after the same manner as a man might build a house and occupy it. This habit, I believe, is common in other cool climates. I was not aware of the fact until a few days ago, when Mr. Lees called my attention to an article on "Winter Birds" in the December number of *Blackwood's Magazine*, 1889. I will give the quotation: "In times of severity he seeks the innermost eaves and holes of thatches, gnarled ivy roots and interior of barns, being a lover of warmth to no inconsiderable degree. Certain it is that at times, when nesting cannot possibly occupy his mind, he may be seen dragging feathers about which evidently are to warm the nest last used in summer." It was gratifying to learn that observations in Canada were in such complete harmony with those made in England on this peculiar habit of the sparrow. It would be a reasonable conclusion to arrive at, that it was a case of adaptation to climatic conditions.

Sparrows begin nest-building very early in the year, and it is certain that occasionally they hatch young in February. I was informed by Mr. Fletcher a few days ago that he saw sparrows carrying hay and other materials to a nest on Metcalf street in the last week of last January, also that a warm new-laid egg was found in Mr. A. McIntyre's porch on the 18th day of the same month. Mr. Armstrong, M.P. for one of the ridings of Middlesex, tells me that he saw fall from a sparrow's nest in this city, in the last week of February, three or four years ago, a half-fledged sparrow; there were probably others in the nest.' Notwithstanding the above, there are reasons, however, for believing that the breeding season does not fairly begin until the latter part of April or the beginning of May.

It may be owing to the fact that sparrows have been brought so much into contact with man that they have attained to such a high degree of intelligence. There is little doubt but that they exercise a greater degree of cunning, it may be called, in self-preservation and applying means to ends than do most of our native birds. A case illustrative of this fact I saw in one of the papers a short time ago. It is as follows: A gentleman in one of the neighboring States, having been greatly pestered with sparrows undertook to destroy them. To do so he soaked wheat in a solution of arsenic and water for some time, and then had it thoroughly dried. This he scattered about in places convenient for the sparrows to get. In a yard close by he had a lot of chickens which he was in the habit of feeding with the same kind of grain, unpoisoned of course, and where the sparrows were in the habit of congregating and eating the wheat along with the chickens. At first the sparrows readily ate the poisoned grain, but, soon experiencing the disagreeable effects of eating grain otherwise than in the company of the chickens, refused to eat wheat at all, whether poisoned or not, unless the chickens would eat it also. They knew that it was safest to eat in good company, and acted accordingly. This may be a case of exaggeration and not quite in accordance with facts, but there are so many well authenticated accounts of their sagacity as to leave no room to doubt the statements made concerning their wonderful cunning.

Sparrows are largely used as food in Europe, as well as in this country; even in this city I have been informed that many of them are shot with noiseless guns and used in this manner, and are said to be quite as good as rice-birds or snow-birds. It might have an appearance of cruelty to destroy the pugnacious and self-maintaining little scavenger. I confess I like to see the sparrows hopping about the streets in winter when all the other birds are gone; but when it comes to be a choice between our native songsters and the foreigner my patriotism wells out n unmistakeable accents. Canada for Canadians, and if for love of our country we must wage war, perhaps we cannot do better in the way of showing love to our enemies than by converting them into a savory mess and surrounding them with our own dear selves.

I might have said something about the effect of sparrows on our native birds, as observed at our own place; but as my ten-minute limit has fully expired, I will only say that the number of native birds nesting with us grows fewer year by year, some of them having disappeared altogether.

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EXCURSIONS.

Excursion No. 2.—On 21st June an excursion attended by 110 ladies and gentlemen was held to Casselman on the Canada Atlantic Railway. Notwithstanding the intense heat and the enormous nummers of mosquitoes, which kept in constant attendance on the visitors throughout the day, the excursion was a most enjoyable one. Rare and interesting specimêns rewarded the collectors in all branches. As soon as the Nation River was reached, the leaders made up their parties; some crossed the the river to examine the beds of fossiliferous limestones and to look for Indian relics; some took boats and amused themselves fishing or collecting aquatic plants or animals, while others went off in different directions through the woods and fields culling the treasures which everywhere presented themselves. As evening drew on the party reassembled at the railway station and, after an hour pleasantly spent in discussing the discoveries of the day, as well as the contents of the luncheon baskets, the usual addresses were delivered by the leaders. In the absence of the President, Mr. Robert Whyte congratulated those present on the successful and enjoyable excursion they had all taken part in. The thanks of the Club are due to Mr. Ebbs, of the Canada Atlantic Ry. Co., for the exceptionally low rate charged for the transportation which had made it possible for so many to attend.

Mr. Fletcher spoke of the insects collected and explained the uses of stings amongst the hymenoptera.

Mr. W. Scott, the botanical leader, drew attention to some of the rarer plants he had found. Botanically Casselman is a most interesting locality, several plants found here, not having been detected in any other place near Ottawa. Of these mention may be made of *Saururus cernuus*, *Phlox divaricata*, *Hypericum Ascyron*, *Thaspium aureum* and *Rudbeckia laciniata.*

Mr. W. A. D. Lees gave a good account of the birds seen by his party during the afternoon and spoke of their habits.

Mr. H. M. Ami spoke in his usual earnest manner and explained the rock and clay formations seen on the way to Casselman and there exhibited.

EXCURSION No. 3.— On the 19th of July a most successful excursion was held to Montebello by steamer "Empress." The weather was fine and a large number attended. On arriving at Montebello some visited the famous mansion and grounds, others explored the beautiful mountain from which the place takes its name, while a fortunate few, of the geological branch, were very kindly taken by the Hon. Mr. Papineau some distance up the river in his steam yacht to inspect certain tracks of marine animals there exposed in the rock. They were afterwards most hospitably entertained to luncheon at the Papineau mansion, for all of which, as for many like kindnesses in the past, the club is deeply indebted to Mr. Papineau. While returning by boat addresses were given: By Mr. Ami on the interesting marine tracks mentioned above; by Mr. Whyte on the plants collected, many of which were rare, and by Mr. Lees on the more noteworthy birds observed during the day.

EXCURSION No. 4. August 9th.—A trip to the Mer Bleu, in August, when the blueberries are ripe, has long been talked of by members of the Ottawa Field-Naturalists' Club, but it was not until this year that it could be arranged.

Upon the above date, however, a large party left by the C. A. R. 1 p.m. train, and found that the pleasures anticipated in such an excursion were in no way over-estimated.

On arriving at Eastman's Springs Station, Mr. R. B. Whyte acting as President announced the programme for the afternoon. The party then examined the mineral baths and wells in the vicinity of the hotel, and some regaled themselves on the celebrated saline waters. Mr. Whyte then led the way to the vast peat bog known as the Mer Bleue. Some time was spent in visiting the gas spring and lighting the bubbles of gas as they rose to the surface of the water. The bog itself was very attractive; blueberries (*Vaccinium corymbosum* and its var. *atrococcum* with black berries) were very abundant, and in even greater profusion were the not unpleasant berries of the Choke-berry (*Pyrus arbutifolia* var. *melanocarpa*). The most conspicuous object was the beautiful ruddy Cotton Rush *Eriophorum Virginicum*), with here and there a patch of the white variety. The lovely White-fringed Orchis (*Habenaria blephariglottis*) was found in quantities, as well as many other peat-loving plants.

On reassembling at the railway station Mr. Whyte addressed those present in the happy and entertaining style now so well known to the members of the Club. He spoke of the plants gathered during the excursion. He was followed by Messrs. Fletcher and Kingston, who delivered addresses respectively upon insects and birds. Mr. Kingston's remarks upon the Chimney-swift were listened to with great interest.

EXCURSION NO. 5, TO KIRK'S FERRY.—The last excursion of the season was to the above favourite locality and was well attended. At 9.30 on Saturday morning 6th September six large vans carried off a merry party of over 100 to the grand old Laurentian hills, now magnificent in their glorious autumn array of purple, green, bronze, and gold. The weather was all that could possibly be desired, clear, bright and hot; but tempered by a gentle breeze. A most enjoyable day was spent by all. Those who did not care to follow the energetic leaders sought out shady nooks amongst the rocks by the rapids or strolled quietly through the mountain woods. Prof. Macoun who had just returned from the Rocky Mountains was heartily welcomed by the members of the club.

An hour was well spent, before leaving for home, in listening to the leaders' addresses.

The acting President, Mr. R. B. Whyte, first called upon Prof. Macoun, who gave two most instructive addresses, the first upon the classification of Fungi and the way to distinguish between edible and poisonous varieties. At the request of the leaders in Orinthology, he also spoke at some length upon some western birds which were representative of eastern species.

Mr. R. B. Whyte spoke upon general botany as leader of the botanical section. One plant new to the locality, viz., *Monotropa hypopitys* had been found by Mr. T. J. MacLaughlin.

Mr. H. M. Ami in speaking of the Laurentian rocks amongst which the day had been spent, showed specimens which he had collected during the excursion and mentioned the economic minerals contained therein.

Mr. Fletcher as leader in Entomology spoke of galls and in a general way of the instinct of insects.

The party reached home at 8 o'clock thoroughly satisfied with the last outing of the most successful series of excursions ever held by the club.

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SUB-EXCURSIONS TO THE MUSEUM OF THE GEOLOGICAL SURVEY DEPARTMENT.

Through the kindness of the Director and officers of the Geological Survey, the Excursion Committee of the club has been able to arrange a series of sub-excursions to the Museum on Sussex street. These excursions will be held at 2:30 p.m. on the second and fourth Saturdays in each month throughout the winter.

Three of these meetings have already been held, and were most successful. The first of them was of the Ornithological branch to the bird room.

They were met by Mr. J. F. Whiteaves, Palæontologist and Zoologist to the Survey, who delivered an instructive address upon the habits and noteworthy peculiarities of the birds exhibited as mounted specimens in the cases. Prof. Macoun also assisted in showing the specimens to the visitors, and afterwards took the party to the "long room," where he had arranged a large series of skins of western birds with their eastern representatives, he pointed out the gradual variation which was shown by species obtained at the exreme limits of their habitats.

The second sub-excursion was of the Zoological branch. The club was again indebted to the kindness of Mr. Whiteaves for a most pleasant afternoon. The collection of stuffed animals was made the subject for a most entertaining object lesson.

The third sub-excursion was of the Botanical branch. Prof. Macoun met the party at the door with characteristic geniality and led them to the "long room," where he had laid out a large number of mounted specimens of Canadian plants and upon which he delivered an address which was eagerly listened to and highly appreciated. Some time was also spent in examining and comparing the specimens exhibited. Great interest was shown in the complete and handsome collection of Canadian woods, the economic values and distribution of which were described.

The next meeting will be held on Dec. 13th, when Dr. G. M. Dawson will give a description of some of the more interesting objects contained in the exsensive collection of Indian relics and curiosities, in the gathering together of which he has taken such an active part. The subjects to be explained at their meetings in the Museum will be announced from time to time in the OTTAWA NATURALIST. Mr. Ferrier has promised two lectures upon Mineralogy and Lithology. The Director, Dr. Selwyn, and other officers of the Survey Staff will take charge of the other meetings of the course.

The thanks of the Club are due to the Director and Staff of the Geological Survey for this opportunity of examining the collections in the National Museum under these very advantageous circumstances, and we trust that the sub-excursions will be largely attended.

Those who had the good fortune to attend the three first meetings are very grateful for the courtesy shown them on those occasions by Mr. Whiteaves and Prof. Macoun.

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BOOK NOTICES.

MANUAL OF INJURIOUS INSECTS AND METHODS OF PREVENTION. By Miss E. A. Ormerod. Second edition.

We have just received from our highly esteemed corresponding member, Miss Ormerod, copies of a much enlarged and thoroughly revised edition of her well-known Manual of Injurious Insects. Economic Entomology has made great progress since the appearance of the first edition in 1881, and this progress is largely due to the unceasing efforts of this talented authoress. Her Annual Reports are eagerly looked for by thousands of farmers in England and other parts of the world. There is no writer upon the science of combating the ravages of insects which attack crops, in Australia, India, South Africa, the United States or Canada, who does not quote her opinion as the highest authority upon those subjects which she has studied, and the present remarkable work is just what might have been expected from such a writer. "Insect Life," issued from the Department of Agriculture of the United States, and edited by the highest living authorities upon Economic Entomology, contains the following complimentary notice of this work :—"On account of its convenient size, admirable arrangement, plain language, and abundant illustration, it is almost a model of what such a work should be."—"Miss Ormerod's work cannot be too highly commended."

The merits enumerated above render this work intelligible—nay, indispensable, to every farmer, gardener and fruit-grower who wishes to carry on his work in the most successful manner. Nor is this the case in England alone where the work was written, for so many of the insects mentioned are common to both Europe and America that it will be found of interest to all of our readers. Moreover, from the fact that most of our injurious species have been imported from Europe, we know not at what moment any of the others mentioned in this work may not appear amongst us as a serious tax upon our cultivated crops. The different kinds of attacks are arranged alphabetically under the three headings, Food Crops, Forest Trees, and Fruit. Some new attacks not mentioned in the first edition, and which occurred subsequently to the appearance of that volume, are here treated of at considerable length, *e. g.*, the Hessian Fly, Stem Eel-worms, and the Wheat-bulb Fly. In all cases much additional information is given; but particularly with regard to Wire-worms, Turnip-Flea and Hop Aphis. In the treatment of insects injurious to fruit trees a most important addition is that of the use of the arsenical poisons. The use of these poisons, now so well understood in this country, but which were until quite recently unknown in England as insecticides, has been wisely and boldly advocated by Miss Ormerod during the past two years, and the results have been most satisfactory.

As an appendix to the Manual is given a short and copiously illustrated "Introduction to Entomology," where, in the plainest possible language, the structure and changes of insects are described, and illustrations and definitions of the various natural orders into which they are classified are given, so as to "enable the observer of a crop attack to tell at least what kind of insect is before him," and also "in the list of the orders of insects, notes are given of the most observable of the characteristic points by which the insects composing these different orders may be distinguished from each other."

A glossary of terms and a full index render this work very complete. It contains 410 pages, and is illustrated with 155 excellent figures, many of them from the authoress's own pencil. It is well printed, neatly bound in cloth, and the small price at which it is published ($1.25) brings it within the reach of all.

REVISION OF THE SPECIES OF THE GENUS AGROTIS. By John B. Smith, 8vo. Washington, pp. 237, 1890.

This important work forms Bulletin No. 38 of the United States National Museum. It was begun when Prof. Smith was associated with Prof. Riley at Washington; but was subsequently handed over to the present author for completion, on account of pressure of other work upon the time of the United States Entomologist. Prof. Smith has made a special study of this difficult genus for many years and the present monograph will be gladly welcomed by all students of the noctuidæ. There is no doubt but that the publication will give an impetus to the study of these injurious insects, which was seriously hindered by the lack of such a source of reference. There are five plates, four of sexual and other characters and one of an ideal agrotid, showing the normal maculation and habitus, with the proper names for the different constant markings, which will be of great service to students.

CATALOGUE OF INSECTS FOUND IN NEW JERSEY, 8vo. Trenton, pp. 486, 1890. By John B. Smith.

The above catalogue is issued by the Geological Survey of New Jersey and is a publication of much interest. Local lists are of great value when carefully prepared and Prof. Smith seems to have used the facilities he possessed to great advantage. Being well acquainted with all the leading Entomologists, both from the public positions he has held, and also as editor of *Entomologica Americana* he has been able to avail himself of the assistance of specialists in all the different orders. This catalogue is a valuable contribution to the Science of Entomology in North America, and we trust that ere long many others of the States will follow the good example set by New Jersey. 6,098 species are recorded as occurring in the State.

PLANT LICE AND HOW TO DEAL WITH THEM, by John B. Smith.

This is Bulletin No. 72 of the New Jersey Agricultural College Experiment Station. It is a pamphlet of 27 pages and is illustrated with 16 exceptionally good illustrations, all of which are original. The insects treated of are the Wheat Aphis, which, as well as its parasites, is fully described, the Cabbage Aphis, the Black Peach Aphis, the Cherry Aphis and the Melon Aphis. In all cases the best remedies are given and the method of their application is described. For such plant-lice as attack vegetation above the ground, Kerosene Emulsion and Whale-oil Soap are recommended, and for those species which attack the roots, periodical dressings of Kainit of Potash were found effective This substance not only acts as an efficient fertilizer, but also destroys many of the plant-lice. The application should be made just before a rain, if possible, so that the salts can be at once dissolved and carried into the ground.

This bulletin will be read by many with great interest, and from the language in which it is couched it can be understood by every one.

We take much pleasure in congratulating our esteemed corresponding member for having produced one of ehe very best bulletins ever yet sent out from any of the United States Experiment Stations. The language is plain, the matter is well arranged, and the illustrations are good; merits which cannot but commend it to agriculturists, the people for whom it is prepared.

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CORRESPONDENCE.

To the Editor of the Ottawa Naturalist:

SIR,—In answer to the letter of Mr. W. E. Saunders in the OTTAWA NATURALIST for August, I beg to say that when I visited the marshes near Kars in 1883, I, unfortunately, was not in a position to secure any specimens of the birds I took to be Short-billed Marsh Wrens (*Cistothorus stellaris*). As my visit took place seven years ago, my recollection of what occurred is not very distinct, but I remember seeing a large number of what I believed to be Short-billed Marsh Wrens, and getting quite close to a few of them. I was not, however, familiar with the species, nor was I then aware of its limited range. I had no doubt at the time of the correctness of the identification, but would have made an effort to further verify it before placing it on record had it not been for the fact that one of my co-leaders in Ornithology, Mr. Geo R. White, reported the capture of a female of the species near the Rideau on the 22nd of June of the same year. (See "Transactions" 1883-4, p. 141). This, I concluded, settled the matter. I have never seen the skin taken by Mr. White, but I preume it must still be in his collection.

Yours truly,
Ottawa, August 5, 1890. W. L. SCOTT.

NOTE.—The above note was sent to me by Mr. Scott immediately after the appearance of Mr. Saunders's letter, but was accidentally mislaid. The delay, therefore, in its appearance must be attributed to the Editor.—J. F.

The following interesting letter has been handed to us for publication by Prof. Macoun:

265 YONGE ST., TORONTO, NOV. 23RD.

To the Naturalist of the Geological Survey, Ottawa.

A few days since, I received for mounting, a very uncommon bird which proved to be a hybrid between a Pintail Duck and a Mallard.

It is a male with a beautiful blending of the plumage of both parent birds, In shape and length, it resembles the Pintail, measuring 25⅜ in. : tail 5⅜, culmen 2⅛, wing 11¼, tarsus 1¾, toe without nail 2, as against the measurement of a fresh Mallard I got for comparison: Length 23¾, wing 11, tail 3⅞, culmen 2⅛, tarsus 1⅞, toe 2⅛. The bright green head of the Mallard is toned down to a brownish green, and the ring runs up behind towards the top of the head, as in the Pintail, while below it extends and fades into brown or chestnut. The wing contains green instead of the deep violet or purple of the Mallard. The wings are the same as in the Pintail, having the pencilling much heavier than the Mallard. It is a very interesting and fine looking specimen.

In Mammalogy too, I have just received a curious specimen; a red Deer, half white. Although a heavy buck, it is not nearly as tall as an ordinary one. The white extends from the belly to half way up to the back, on sides of face, top of neck, shoulders, front leg and hind quarters. It was killed on Cove Island, Lake Huron. When I have it completed I intend to have it photographed.

W. CROSS,
(Taxidermist and Naturalist)

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THE WINTER LECTURES.

Throtgh the kindness of Dr. J. A. MacCabe, Principal of the Ottawa Normal School, the winter courses of lectures will be held in the commodious and comfortable Lecture room of that institution. This is a great advantage, and one which we feel sure will be appreciated by all our members. The programmes for the two series of lectures are presented herewith, and will be found to contain papers of great interest. The soiree committee, in drawing up the programmes, particularly endeavoured to obtain papers which would be of interest to the general public as well as to naturalists.

The educational aims of the Ottawa Field-Naturalists' Club have been kept prominently in view, and to further this end it has been decided by the Council to make admission to all the lectures in both courses free to any who may wish to attend.

With the object of making the lectures as entertaining and instructive as possible, where practicable specimens will be exhibited illustrative of the subject discussed.

The chair will upon all occasions be taken promptly,—for the evening lectures at 8 o'clock, and for the Monday afternoon popular science lectures at 4.15 p.m. These afternoon lectures will last for 45 minutes, and 15 minutes will be given for discussion.

1890. Ottawa Field-Naturalists' Club. 1891.

EVENING LECTURES 8 P.M.

1890.

Dec. 11.—Science as an Aid to General Education......Dr. MacCabe.

President's Inaugural Address..................Dr. Ells.

1891.

Jan. 15.—Report of the Zoological Branch.

The Beaver..................................Mr. Lett.

29.—Report of the Ornithological Branch.

The Chimney Swift......................Mr. Kingston.

Canadian Gems..............................Mr. Willimott.

Feb. 12.—Report of the Botanical Branch.

The Development of Cultivated Fruits from Wild Varieties........................Mr. John Craig.

26.—Report of the Conchological Branch.

Some new species of Chazy Fossils............Mr. Sowter.

A Botanist among the Glaciers.............Prof. Macoun.

Mar. 3.—Report of the Geological Branch.

Asbestus..Dr. Ells.

12.—Report of the Entomological Branch.

Mineral Phosphates..................Mr. Lainson Wills.

MONDAY AFTERNOON LECTURES 4.15 P.M.

Jan. 12.—The Study of Natural History...........Miss M. A. Mills.

19.—The Geographical distribution of Plants......Prof. Macoun.

26.—The Educational value of Botanic Gardens...Mr. Fletcher.

Feb. 2.—The Physiology of Plants..................Mr. W. Scott.

9.—The Migration of Birds.......................Mr. Lees.

16.—The True Bugs........................Mr. Harrington.

23.—The Chemistry of Food (1)....................Mr. Shutt.

Mar. 2.—The Chemistry of Food (2)..................Mr. Shutt.

9.—Beneficial Birds.........................Mr. Kingston.

N.B.—All the above lectures will be delivered in the Lecture Room of the Normal School. Admission free. Anyone wishing to attend will be welcome.

EVENING LECTURES.

THE OPENING ADDRESS, DELIVERED DEC. 11, 1890.

The first meeting of the course of Thursday Evening Lectures, arranged to take place during the winter, was held in the Normal School on the above date, at the advertised time. Dr. J. A. MacCabe, the Principal of the Normal School, opened the meeting by delivering an Address of Welcome. He stated that owing to the fact that they were in the midst of the closing examinations it had been quite impossible for him to prepare the address he had proposed. He had two objects in view in granting the use of the Normal School Lecture room for these Free Popular Lectures, which he was certain could not but be of great value to the students attending the school and to the citizens of Ottawa. The first object was to show, as expressed in the title, that "Science" was given on the programme for his address " an aid to general education," the second was a very easy and pleasant one, namely, to extend to the members of the Ottawa Field-Naturalists' Club and their friends a very hearty welcome.

Speaking of the educational value of science he drew attention to the fact that no one was too old to learn—the time never came to anyone when he could say he had finished his education. A person's education was always progressing, and was influenced by every person or object with which he came into contact. Taking this into consideration, he said we all must appreciate that the great fountain and source of knowledge lies outside the class-room, and is not found in text books alone, but must be sought in the great world of Nature. Teachers are frequently told to study Nature's methods; he would go further and say: Study Nature herself.

Speaking of the good work which had been already done by the club, Dr. MacCabe foresaw great advantages from the present course of lectures, not only to the Normal School and the city of Ottawa, but to the whole district.

He concluded by wishing the club every success, and then introduced Dr. Ells, the president of the club, who delivered the following :—

PRESIDENT'S INAUGURAL ADDRESS—1890.

Ladies and Gentlemen,—In opening the lecture course of the Ottawa Field-Naturalists' Club for the present season, I feel that there are several things which call for a word of general remark before we enter upon the discussion of the several scientific subjects which, as you will see by reference to your programmes, the Soiree Committee have so liberally provided for our entertainment. And, first of all, I think this society has great cause for rejoicing, in the fact that we have had placed at our disposal, through the kindness of the authorities in charge of the Normal School building, and more particularly through the courtesy of Dr. MacCabe, the Principal, the large and commodious rooms of this institution in which to hold our lecture courses; a change, I am sure, that all will appreciate, not only those whose place it is to speak to you but those who may listen; for there is no denying the fact that much of the pleasure and profit derivable from any lecture course is dependent upon comfortable and attractive surroundings. On behalf of the Club, therefore, I would desire to tender our thanks, through Dr. MacCabe, for the privileges which have been hereby conferred upon our society, more especially since, through this courtesy on their part, we are enabled to extend very considerably the aims of this club, in that we are now in a position to tender a cordial invitation to the large classes of students who attend the Normal School to be present at all our lectures and soirees, a thing impracticable heretofore owing to the limited lecture room at our disposal. In this way, I say, the original purpose of the club's work, viz., that of Education, will be very greatly facilitated.

I must, in the second place, congratulate the club as a whole on its rapidly increasing membership, which now reaches nearly 300 persons, as well as upon the fact that many of our new members are persons of influence at points remote from Ottawa, and among whom are represented the several provinces from the Atlantic to the Pacific; a feature which, I take it, is largely due to the change in the policy of the club two years ago, when the scope of its work and transactions was extended. In this extended membership I see a very great element of strength, so much so that I feel, if we can keep up the interest in the society at its headquarters by continuing to furnish such excellent programmes for our evening and afternoon lecture courses, this interest will gradually spread to the remotest limit, till presently we shall find the little society in Ottawa a gathering centre for information from all parts of the Dominion, concerning which aspect of the question I may have something further to say presently. Though I regret that owing to absence I was unable to be present at but two of your excursions, I am glad to know that throughout the season they were markedly successful, both in the numbers attending them and in the greatly increased interest manifested in the several scientific branches which were discussed. I think, therefore, on the whole, the club has great cause to be proud of the work already accomplished, and, judging from the progress of the last two years, it can safely be predicted that before the next decade, at the present rate of growth, this society will be the largest and most influential scientific body on the American continent. To some this may seem a far-fetched notion, but, I think, if we look at the composition of the club as it is to-day, with its long list of names, among which are those of many men distinguished for scientific attainments in every branch of Natural History, both at home and abroad, you will all agree with me that the realization of this ambition lies entirely within ourselves. And why should it not be realized? Why should not Ottawa, the centre of legislative and political influence, the most important city in many respects in the Dominion, the seat also of the largest purely scientific staff in the country, as well as of the Royal Society, with its several important institutions of learning, be also the headquarters of the largest and most important scientific society in Canada as well? I firmly believe, if we pursue the proper methods to this end and do not allow our zeal to flag, we shall see this aim accomplished. By enlarged membership we secure enlarged means, and with increased means greater facilities for publication and extended influence. I do not know of any society or scientific institution anywhere, either in this or the adjacent great country of the United States, which, for the small sum of one dollar a year, provides such an amount of valuable information, both in its lecture courses and in its publications, as the Ottawa Field-Naturalists' Club.

I trust I have said sufficient to indicate the future possibilities of this club, and to some of us the time appears to be drawing nigh when even a yet larger field of operations than any heretofore contemplated may be safely entered upon—that is to say, the establishment, not of an international but an inter-provincial science association, which, having its headquarters here in the Ottawa Field-Naturalists' Society, may, by means of its widely extended branches, gather together scientific information from every quarter, with many things of great value, which can be here arranged and placed on record. For, though the club has no museum of its own, the museum of the Geological Survey Department will always be only too glad to be the curator of valuable specimens in the several kingdoms of Natural History, and should be the natural receptacle for them. The present museum space is none too great, but some of us as members of the Geological Survey, and all of us as citizens of Ottawa, do not despair of the coming of the time when, upon some one of the beautiful spots in this city, there shall arise the magnificent proportions of a national museum within whose walls shall be gathered together and properly arranged the large and exceedingly valuable collections which are now found in the old building on Sussex street, a building which it is no sacrilege to say, is utterly unworthy of the treasures therein placed, exposed every day as it is to the risk of destruction by fire owing to the character of its surroundings. In this museum of the Geological Department are to be found specimens, not only illustrative of the geological formations and of the mineral wealth of the Dominion, but extensive collections in the branches of ethnology, botany, ornithology, entomology, conchology, etc., collections more extensive by far than the capacity of the building will even now accommodate, and many of which are, as a consequence, laid away in drawers and out-of-the-way places simply for the reason that there is no available space for their display. These collections, moreover, are increasing at a wonderfully rapid rate, as may easily be imagined, from the fact that of the large field staff that go forth every spring each one forwards annually whatever is found illustrative of the field which he is working, so that, of sheer necessity, the erection of a new museum, or the very considerable enlargement of the present one, must be undertaken at no very distant date. In such an event, with a national museum erected, it is easy to see what a power for good scientific work such a scheme as that now proposed would be, in the contributions not only of wonderful and valuable materials to every branch of Natural History, but in the great collections of important scientific data that constantly accrue. Throughout all the provinces of this Dominion which I have visited, many persons interested in some one of the various branches of Natural History will be found. Botany, ornithology, entomology, etc., all have their students among persons whose tastes incline them to the study of the many objects of interest which are common to every one of Nature's fields. These observations are, however, checked or hindered by the fact that there are no local societies in most of these places where assistance in determining the specimens can be found, unless, indeed, at considerable expense; and also by a lack of opportunity for presenting the facts obtained, many of which are of very great importance to the scientific world, and by means of which the results can be made known to the host of persons interested in such pursuits. To all such workers the methods of the Ottawa Field-Naturalists' Club must commend themselves heartily, since in the work of this club there is an honest effort made to acquire as well as to impart information in nearly all the branches of Natural History. I can see, therefore, no reason why this society, having already shaken off the local trammels which once bound it according to the terms of its original constitution, should not go on still further and enlarge the scope of its operations to an indefinite extent by incorporating in its ranks the best talent found in our High Schools and other educational centres throughout the length and breadth of our country, as well as all those whose tastes incline them to the study of the natural sciences.

To this it may be objected by some that local societies are already in existence in the several provinces, and therefore there is no field left for extending the scope of our own society in this direction. It is true that such societies exist in cities like Halifax, St. John, Quebec, Toronto, Ottawa and Winnipeg, but of many, and in fact most of these, the work is of a different character to that contemplated by the

Field-Naturalists' Club. Some of these societies dealwith literary and historical subjects only ; others confine their observations largely to but one branch of Natural History ; while of others, again, owing to the very doubtful policy of leaving the management in the hands of men who, from business engagements or advancing years, do not possess the necessary animus to keep the societies' aims prominently to the front, or, in fact, to keep the society itself alive in its fullest sense, it is to be feared they have fallen rapidly into the background and are not conspicuous for the amount of scientific work done. In none of these, probably, or at least in very few, is there any attempt at obtaining a membership outside of the city in which the society is located ; and it is in this particular respect, if in no other, that this society has already secured a prominent place in the fact, that our membership even now embraces persons from Nova Scotia to British Columbia.

At the last meeting of the Royal Socicty of Canada a scheme was suggested for the acquisition and arrangement of various scientific data, such, for instance, as the arrival and departure of our birds, the first flowering of plants, the putting forth of the leaves on the various kinds of forest trees, and other kindred subjects, work which has been done locally by the members of this society ever since its organization. By many of us, however, I think it will be admitted that, while the Royal Society, from its elevated position as the leading literary and scientific society of Canada, stands in a particularly favorable position in regard to its smaller, and I think we may allow the expression, sister societies in literature, science and art, to lend the support of its great influence to all those which, as working organizations, must ever be the great gatherers and collaborateurs as regards the material from which scientific conclusions may be derived, the work itself must and can only be done by persons laboring actively in the out-door realms of Nature, and in actual contact with the things which surround us, whether in the hard and puzzling problems of geology, in the pleasant and instructive study of botany, or the delightful study of our birds, insects and shells, or in some of the more minute forms of animal and plant life. The materials thus obtained by these working societies, like the Field-Naturalists' Club, and the quantity of these should, in a short time, reach large proportions, can then be discussed, and the conclusions arrived at arranged and presented at the winter sessions, after which the final results can be presented to the Royal Society of Canada in a series of papers which would form a most valuable contribution to our store of scientific knowledge, and which would be, by this society, put on record, and in case of doubtful points, could there be further discussed and the points in dispute carefully considered and settled. The question, then, of extending our membership in the way just indicated is one which I feel should be earnestly and speedily considered, and I am convinced that such a course will be conducive to the highest possible gain to our club as a whole and to the furtherance of scientific investigation throughout the Dominion.

I have had considerable difficulty in arriving at any conclusion as to what would be most profitable to present to the Club's consideration to-night in this opening address; for I think it will be unnecessary to designate the few remarks I may have to make by the title of lecture. You will see by reference to the programme of our winter courses, both for the evening and afternoon lectures, that there is an unusually good variety of material, embracing the Animal, Vegetable and Mineral Kingdoms. Among the latter we shall, I trust, have the pleasure of learning about the mode of occurrence, peculiarities and distribution of that important substance, mineral phosphate, concerning which Mr. Lainson Wills has kindly promised to give us some information, while in the department of Canadian gems we may also expect a treat in the contemplation of really beautiful things; for although Canada cannot as yet produce the diamond, the ruby or the emerald, she can furnish exquisite gems for personal ornament or for interior decoration, as you will be enabled to testify after seeing the exhibit which will, doubtless, be made on that occasion. The mode of occurrence and characteristics of that very peculiar mineral, asbestus, are also to be described. In the department of Natural History you will hear our ever-welcome friend, Mr. Lett, who will tell us of the habits and peculiarities of the beaver, an animal now unfortunately rapidly becoming extinct in Eastern Canada owing to the fact that it is hunted very often without regard to proper observance of close seasons; while botany, in the more familiar form to many of garden decoration, will be discussed by one of the staff of the Central Experimental Farm. In the afternoon lectures, which are supposed to be of a somewhat more elementary nature, botany will also take a somewhat prominent place, while the chemistry of food, a somewhat new branch in connection with the work of this club, but one of very great practical importance, will also be ably discussed. It may, therefore, be safely predicted that both the evening and afternoon courses of lectures for the coming winter will equal in every respect any which the management of this society has ever yet been able to provide, and will amply repay any who may be able to attend them for the amount of time and effort therein involved.

I must not omit in this connection to call the attention of the members to a new departure in the matter of sub-excursions for the coming winter. In former years these sub-excursions, as you all know, were supposed to terminate in October or with the coming on of cold weather, but this year, owing to the courtesy of the Director and staff of the Geological Survey Department, it has been arranged that these excursions will be continued on the alternate Saturday afternoons of each month during the winter to the museum on Sussex street, and some one of the branches of Natural History as there displayed will be discussed and illustrated by one of the officers in charge. Several of these gentlemen have already expressed their readiness to explain the leading features in the several collections, and it may be safely stated that the hour or two there spent will not be wasted.

While I do not propose to-night to go into any elaborate discussion on the comparative merits of any of the sciences, I think it is only fair to point out, in a working society like this, some of the great benefits that may be derived from the study of some one of the various branches of Natural History, more particularly since it has always been the aim of this club to keep prominently before the general public the higher education along these lines. And just here it is fitting to remark that it would seem that our present location in the buildings of the Normal School is one particularly adapted to forward our aims in this direction. Here we have annually a large number of students from many portions of the country, young men and women, who may be supposed to represent the more progressive elements in either sex, and who have arrived at that stage of life when, as instructors of youth, they are supposed to have a very fair idea of what constitutes the best and most useful part of a liberal education, and to know the best means of imparting the same to those with whom they are brought in contact. To all such, both of those who are here to attend the winter session, and those who are present during the earlier part of the year, we can say most confidently that an attendance at the regular lectures of the winter courses, or at the regular outings of the summer and autumn, which may be said to extend from the 1st May to the 1st of November, will be time most profitably spent, and be productive, in most cases, of far better and higher results to those engaged in the work of teaching than the same time devoted to the study of some prosy text book. In this way, too, by opening some hitherto unexplored pathway among Nature's choicest treasures, and by awakening in the mind some new and hitherto unexpressed desire for a further and broader acquaintance with some of the more varied forms of matter, such a plan will, it is safe to say, tend to kindle the higher and nobler part of our natures and enhance our capacities for enjoyment tenfold. True it is that all dispositions do not regard the study of the natural sciences with the same feeling of delight. To some there is, unfortunately, no enjoyment in the contemplation of the beauty presented in the unfolding rose, or in the flight of the delicately tinted butterfly. To some, also, the study of the fossils embedded in the rock, or the contemplation of the wonders seen on every hand, does not raise the mind to the consideration of the grandeur and condescension of that Master designer of the universe that has fashioned all things with such wondrous art, and created for man's enjoyment such wondrously beautiful things. But in so far as the teaching portion of our community is concerned, I believe there is no way by which those so engaged can exercise so beneficent an influence on those entrusted to their care as by frequent short excursions over the neighboring fields; by unfolding to them the beauties of structure displayed in every opening flower, by showing the wonderful convolutions of the many dainty shells which, though more rare than the flower, can also be easily obtained, the increased necessity for closer search, serving often but to enhance the pleasure of the discovery. What, for instance, can be more interesting than to study the habits of some of our most common insects, to watch the various evolutions of our common ants, to note the gorgeous colors and graceful flight of som of our moths and beetles? All these things appeal most strongly to the sense of the beautiful which will be found implanted in the breast of by far the greater number of our youth, and which in many cases requires but the smallest encouragement to spring up and develop into what may make of its happy possessor a painter, a sculptor, a naturalist, who may be conspicuous among his fellow men for the power of depicting whatever is great and beautiful in the domain of his chosen art. How many an Audubon, Cuvier, Darwin, or Linnæus, may we have in our very midst, to whom the divine spark which is necessary to kindle into flame the slumbering forces of these youthful minds may be imparted by a chance word of encouragement or of sympathy, and to whom a chance excursion into the domain of Natural History may prove the starting point upon a career which will bring renown, not only upon himself personally, but upon our country as well? If, indeed, no such prominence is reached, the habits of observation thus engendered will prove to be such that the powers of mind will be strengthened very materially, for, whatever pursuit in life may be adopted, it will be found, without a doubt, that the study of Nature in some one of her many forms will tend to make life easier and happier, and will cultivate and refine our ideas; and not only this, but this study will tend directly to impart breadth and solidity to all our conceptions, to lift us out of the narrow rut into which one is far too prone to be drawn; to extend the scope of our possibilities, and to make gladder the whole pathway of life. When one thinks of the privileges enjoyed by the instructors of our youth at the present day, in the acquisition of knowledge concerning Nature in all her forms, not only through the medium of the lecture room, but through the agency of text-books, which have increased so rapidly and obtained such an excellence that one finds it almost an impossibility to keep in line with them, we can but hope that those to whom are entrusted the moulding of the minds of our nation will carry out their work on the broadest and noblest plan, and make full use of all the best and choicest methods at their disposal. The study of all these things carries us at once into the broad domain of science, and a knowledge of the anatomy of the beetle, or of the habits and life history of one of our most ordinary insects, things which can be picked up anywhere by hundreds, are as pregnant with importance, in so far as we know, as the most abstruse problems of the astronomer or the physicist, who endeavors to ascertain the composition and life-history of the remotest of our planets, or with the studies of the geologist who strives to decipher and to map out the life history of our own planet. In fact, the former often presents problems of the greatest practical scientific importance, since by the study of the common living things around us, and by the determination of their habits and modes of existence, the greatest benefits to the human race accrue.

The practical application of science in some one of its many forms is at the present day so universal that we have long since ceased to consider it as entering into the doings of our everyday life. Yet, when we allow ourselves to glance for a moment at the various processes going on around us, we are brought at once face to face with the fac that, even in the simplest and most ordinary avocations, its influence is everywhere visible. The word science is derived from the Latin word *scio*, meaning to *know*. There is, therefore, no mystery about the word itself in its general or ordinary acceptation, and it simply may be used as another term for knowledge in its highest and truest form. Science has been defined as, knowledge, certain and evident in itself, and the basis of all science as, the immutability of the laws of Nature and of events. The varieties of scientific knowledge are almost endless. Thus we have the science even of Mathematics, which deals with abstract truths, of Jurisprudence, of Logic, Chemistry, Astronomy, Geology, Rhetoric, Grammar, and a hundred others, including the more abstruse sciences of Metaphysics and Theology. Some of these may be regarded as speculative sciences; others deal with the material alone, and whatever theories arise are supposed to be founded entirely upon the facts which are ascertained during the processes of investigation. In this latter class may be placed those which deal with the phenomena of Nature, with which we more particularly have to do.

With many the idea appears to prevail that science is a thing of comparatively recent date, and in their egotism these suppose that the citizens of the nineteenth century should almost be permitted to claim for themselves a monopoly of the honors arising from the unravelling of Nature's secrets. While, without a doubt, the growth of knowledge in all its branches has, within the present century, proceeded at an exceedingly rapid rate, we must not as a consequence infer that our ancestors of a thousand, or even of five thousand years ago, were destitute of inventive genius, the faculty of reason, or the ability to put their common sense to a profitable use, or that their craniums were not furnished with as good a quality of brain matter as those of the present day. The magnificent ruins of fifty, or even possibly a hundred centuries ago, since no real date can be assigned to many of these monuments of a long extinct people, which are found both in the new and old worlds, show at least that the sciences of architecture, of sculpture, and of the highest of the mechanical arts, must have reached a very advanced state of perfection even at that early time; while among the very earliest remains of our race, viz., those who dwelt in caves and were contemporaries of monstrous beasts which have long since become extinct, such as the mastodon or the cave bear, when the ice of the glacial period was even yet descending from our mountain sides, we find that the genius of sculpture, and to a certain extent the knowledge of it existed, though probably without having reached any very great degree of excellence. The magnificent sculptured forms and architectural wonders of Egypt are familiar to you all, and show that in this country, one of the great centres of the human race, knowledge of these arts had also become very highly developed, according to the most recent and reliable investigations at least 6,000 years ago; while on our own continent, in the curious remains left by the mound-builders and the cliff-dwellers, races so far removed that their origins have never yet been satisfactorily explained, but which evidently have preceded the present races by an unknown and lengthy period of time, many of the lines of decorative work have also been cultivated to a very considerable degree. In fact, the present race is very often confronted with the accuracy of the statement that "there is nothing new under the sun," and it may probably be accepted as a sober truth that, making all due allowance for cultivation, the human nature and the intellect of the present day, differs very little, and that not in kind, from that which prevailed among the earliest settlers of the globe. It may even be said that, with many of the so-called startling discoveries of modern science, it is known of some at least that these are but the re-discoveries of arts which perished with the records of a former people.

It has been already suggested that science in some of its forms enters very largely into our most ordinary pursuits. As an illustration of the complexity of the subject, and the mutual interdependence of one science upon another, let us glance for a moment at even so apparently simple a thing as the making of our daily bread. Here we should probably, first of all, obtain a knowledge of the conditions of climate which are most favorable to the growth of cereals, and this opens to us at once the great domain of the sciences of climatology and meteorology. The conditions of soil, again, also a question of great importance, brings us to the study of chemistry, physics and geology, while the sowing, harvesting and grinding of our grain introduces us into the wonderful field of applied mechanics, the skill of whose students is so largely devoted to the invention and perfecting of the best and most labor-saving appliances by which these operations can be most satisfactorily effected.

In the second stage of the industry, chemistry again comes into play in the laboratory of our kitchens and in the production of the best materials for producing the finest varieties of bread from the prepared grain, and in this connection also several sister sciences are invoked in the invention and building of our ranges and other appliances for the cooking of the materials after they are ready for that process. If we follow up our illustration to its legitimate conclusion we shall have to go back still farther and bring in the aid of several other important assistants. Thus we must have the science of geology to determine the presence of the coal-beds from which we derive the necessary fuel to supply our ranges. Then we have the sciences of palæontology and palæo-botany to determine the age of the coal plants which accompany these coal beds, and the science of mining engineering, by which the coal, and even the iron ores from which our implements and ranges are manufactured, can be extracted and brought into useful shape, in which process, also, we have the aid of the sister science of metallurgy, and so we might pursue our illustration almost indefinitely and show that in every department of our life's work there is an exceedingly close relationship everywhere existing between the various branches of scientific knowledge.

While, therefore, the study of the sciences should be of the greatest practical value to all, there are certain forms of thought or study which are by many supposed to be possessed of more elevating tendencies as regards the development of the mind than others. Yet it seems scarcely fair to make any such invidious distinction in the value of scientific knowledge itself, but if any such peculiar tendency is apparent among the mass of mankind in general, to attribute such peculiarity rather to the particular bias of the individual himself, since it is a well recognized fact that the tendency of the human mind in different individuals is exceedingly diverse, so that to some the study of the most intricate problems pertaining to the sciences of pure mathematics or metaphysics is capable of affording the highest type of mental delectation, while to others such studies are conducive only of weariness and even of disgust itself.

It is evident, I trust, from what has already been said, that there is nothing in the study of the natural sciences which is not of a character to elevate both the physical and moral condition of mankind, and yet, in regard to some of these, there is a certain feeling of hostility displayed which occasionally finds expression, but which is due apparently rather to a lack of conception of the principles involved in their study than to any other cause; so hard is it even among those who are generally considered as enjoying the advantages of a liberal education to cut entirely free from the old leaven of mediæval superstition, belief in which very often proves stronger than the exercise of the strongest common sense. As an illustration I may merely mention the fact that, not many years ago, one of the most popular lecturers of this city, at that time, assured me that he had read everything which he thought had a bearing upon the subject of the creation of the world and on the doctrine of evolution, and yet retained the impression that all the phenomena which have taken place since the period of chaos down to the beginning of the seventh day, could be easily included within the space of six literal days of twenty-four hours each, from which we may realize in what exceedingly narrow grooves some minds, excellent in other respects, are cast. We may be disposed to regard this as a somewhat exceptional case, and wonder how any one, possessed of even a moderate share of common sense, can prefer to cling to the exploded and antiquated ideas of the middle ages rather than to allow his belief to be influenced by the light afforded through modern research ; yet the fact is still evident that the old views concerning some of the now well proved and generally accepted truths of science to some extent yet prevail. To the earnest student of Nature, however, there is nothing more certain than that broader and truer views of the harmony and fitness of all things pertaining to the material world will be presented as knowledge of these things increases, and that a grander and more correct conception will be afforded of the great Author by whom all things have been brought into existence and by whom they are harmoniously controlled.

There is yet one aspect of the scientific question which to us, as students of Nature in all her forms, need have no direct practical interest, but which, owing to certain circumstances, has assumed such a phase at the present day as to merit a word of explanation. To many of us the expression, "conflict of religion and science," is familiar enough, but to some at least I fancy the phrase is, to a very large extent, nearly meaningless. The aims of scientific investigation are, or should be, the acquisition ot truth itself concerning the phenomena of Nature, and its conclusions are based upon the examination of the material things around us. The aims of religion are also associated with the ascertainment of truth in its highest form, but these have an entirely different bearing, and are not confined to the material, but rather deal with the immaterial or immortal portion of mankind. In certain points these two lines of investigation tend to converge, and in such cases, owing to imperfect interpretation on one side or the other, or possibly on both, there is an apparent clash of opinion.

It is plain, however, that science, that is, natural science, was not intended as a hand-book to each religion, except, possibly by induction and in its broadest sense ; and it is equally plain that there is no reason why religion should be so twisted out of her natural sphere as to cause any direct interference with the teachings of science, seeing that the two proceed in such entirely different lines.

Any apparent discrepancies which may exist in the interpretation of the two books which have been given us, viz., that of Revelation which we call the Bible, and that often styled the unwritten page around us, the Book of Nature, and yet which, in truth, is a book written in plainest lines in every page, should, since they both have come from the same great source, be rather attributed to a lack of skill in those who attempt to read them ; since if we accept the statement that the Bible is the word of God, and the other statement, which is equally true, that there is an overruling force which controls the phenomena of Nature, in accordance with certain fixed and, in some cases at least, well known laws, the interpretation of such phenomena should, if correct, agree in their essentials even though viewed from different standpoints.

The term Agnostic, which now-a-days one frequently hears, has of late years assumed considerable prominence, and possibly more than it really deserves. The derivation of the word is from the Greek, and literally means one without knowledge. In its ordinary acceptation, however, it is held to signify one without definite knowledge of the Creator or God, or of the plan of creation. If we take the word in the broad and natural sense it has no meaning at all as applied to mankind, since every one is supposed to possess at least a certain amount of information, while no one is held to be perfect in every branch of knowledge.

If, on the other hand, we limit its meaning to those who have a lack of knowledge of the fundamental truths of theology, we, as Christians, must also, even from our own standpoint, to say nothing of that of the scientist, properly so called, acknowledge ourselves worthy the title in certain respects, since many of the accepted tenets of Christian belief are articles of faith only, and are not susceptible of actual demonstration. Though we may claim we have a clear conception of the plan of Creation according to the scheme laid down in Genesis, the exceeding terseness of the scheme as there presented is such that we know that it cannot be taken in its literal sense, and the theologian is indebted to the scientist for the presentation of more light upon a question which has produced much unnecessary, and often unseemly, controversy. When such uncertainty exists, therefore, it does not, to many, seem the wisest course that anyone should dogmatically assert any particular line of doctrine, and claim for himself infallibility in its interpretation, especially when the data given are confessedly so imperfect. It is, therefore, easily seen that this term *agnostic* is one exceedingly hard to define clearly, and in the heat of controvery is very apt to be used so loosely that the results are frequently as damaging to one party as the other.

But it is not very clear to many why the word should be used at all in the sense as generally understood. With its broader meaning, doubtless, it would find scope in the realm of metaphysics, but as applied to the investigator after scientific truth, dealing only with material things, it should certainly have no place. As for any man's personal belief, that is an entirely different matter and one entirely beyond the range of scientific investigation.

The distinction between the terms *agnostic* and *atheist*, if these terms must be retained, while it should be sharply drawn, is apt to be confounded. An atheist, pure and simple, by which one understands a person without belief in God, or in any supreme overruling power, is a very rare being to encounter. Certainly they are very rarely found in the ranks of the earnest workers in the field of Natural Science. The greatest writers and students on these subjects do not hesitate when necessary to express their belief in the existence of a first great cause through which life was first introduced on the globe, and by whom all things are controlled—known, indeed, under different names, such as the Creator, the Infinite, Nature, the Power behind the veil, all of which terms in point of fact resolve themselves into the same meaning. From the fact, however, that scientific problems are supposed to be worked out by the aid of natural surroundings alone, and to be capable of actual demonstration, this portion of their belief is not brought prominently into notice, since there is no absolute occasion for its intrusion, but its influence is everywhere apparent in the lives of our most illustrious scientists.

For many hundreds of years the expression *Gnothi seauton*, know thyself, has been familiar to the human race. Generation after generation has been studying the problem this presented with somewhat indifferent success, and no one will to-day, I think, be so presumptuous as to say, that even in the study of the human frame, and of the phenomena which take place in the human body, have we yet arrived at the perfection of knowledge. How much more presumptuous, then, would it be to say that in any of the great fields of science, art or theology, the expression *Gnothi seauton* has been fully worked out, or that we know but little beyond the merest rudiments of the boundless stores of knowledge which lie therein concealed. To many of us it will, therefore, seem much more fitting that the two great sister civilizers, science and religion, should go forward, hand in hand, intent on the ascertaining of truth itself and the amelioration of the condition of the human race, rather than through the errors of man's judgment or the imperfection of his knowledge, the least semblance of conflict should be apparent.

Theories there are without end in every department of life's work but theories are not always the essential things to which we should pin our faith. It does not follow that the school-boy, when he has reached man's estate, should continue to abide by the dictum of his early preceptor. Had Galileo been content to accept the doctrine of his so-called superiors that the world did not move, but that the heavenly bodies, by their revolutions around the earth, gave rise to the phenomena of day and night, and had the successors of Galileo been content to have followed the same blind path, it is very possible that the science of astronomy, and, in fact, human knowledge in general, would have made much slower progress than it has done since that date. The mere dictum of any man, or of any body of men, will not at the present day, and should not, carry more than its proper weight in the face of an array of indisputable facts to the contrary. The great thing to guard carefully against is the rash putting forth of unsubstantiated theories as theories only; and what is even worse, when such a theory has been advanced, is the deliberate distortion of facts to its support when its weakness becomes apparent or its falsity is clear. This unfortunate condition of things is occasionally found in all the sciences. Thus in the science of geology we have had the fierce warfare of the school of the Neptunists, who hold that all the phenomena of the earth's surface were produced by the agency of water, against that of the Plutonists, who invoked the agency of fire alone as the solver of all the difficulties in the creative problem. Later, we have had the men who contended for the great continental ice sheet extending over the entire northern half of our land, against the advocates of iceberg action and local glaciation only, and so on throughout the chapter. People looking on from a safe distance often wonder how such diverse opinions can prevail on such subjects if the facts are the same in every case. The fault does not lie with the facts but in the peculiar bias of each individual's mind in regard to the interpretation of these facts. The principle sometimes laid down, that the conclusions of those who have preceded us, both in the domain of science and theology, must ever be regarded as infallible, has not only been opposed in large measure to the intellectual advancement of the race, but, if blindly persisted in, would tend to prove a very serious obstacle to any kind of improvement whatever.

True it is there are extremists on either side, and the great factors in the world's advancement, science and religion, should not be held in any way responsible for the foolish utterances of those ill-adjusted intellects which are constantly seeking opportunities to run a muck against any theory or individual that may chance to oppose the peculiar whim of the moment which they may desire to advocate. Truth is great and will prevail, and the differences between the two great schools will in the end be found to be more fancied than real.

The spectacle of the theologian bitterly assailing his co-worker in the cause of truth is not, to the general onlooker at least, a very edifying one. Disputes and misinterpretations will, doubtless, continue to arise, and owing to the imperfection of man's nature, and the lack of completeness of his knowledge, will furnish in the future, as in the past, abundant material for angry recrimination. Not until the final change comes to each of us will the mists be entirely dispelled, and then with clearer vision we shall see and understand all these mysteries, for then we shall see face to face.

At the conclusion of the President's address a vote of thanks was eloquently proposed by Sir James Grant, K.C.M.G., F.R.S.C. He spoke of the good work being done by the club, and particularly by the President and his colleagues in the Geological Survey. He had watched with great interest the rapid progress of scientific studies during the last 20 years, particularly in the Ottawa district and in response to the efforts of the Ottawa Field-Naturalists' Club. He suggested the appropriateness of the club erecting a monunment to the late Elkanah Billings, a native of this city, who had done so much for the honour of the Dominion.

Prof. Macoun, in seconding the vote of thanks, spoke in high terms of the Inaugural Address and also of the Address of Welcome delivered by Dr. MacCabe. He showed the value of originality of thought, and deprecated students sticking to the letter of the text-book. Anyone who would succeed in life must study text-books closely at first, and then strike out boldly for himself. He was pleased to be able to agree so fully with what the Principal of the Normal School had said in his address

The vote of thanks was unanimously carried.

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EDITORIAL NOTES.

SUB-EXCURSIONS TO THE GEOLOGICAL MUSEUM.

On Saturday, 10th January, there will be a sub-excursion to the Geological Museum, when the party will be addressed by Mr. H. M. Ami upon Palaeontology.

On Saturday, 24th, another of these excursions will be held and Mr. Willmott will deliver an address on some mineralogical subject.

PROGRAMME.

Members are requested to pin up the loose programme enclosed herewith in a conspicuous place, so that they may not forget the various lecture days as they come round.

THURSDAY EVENING LECTURES.

During the present month two lectures of great interest are to be delivered. Jan. 15th, Mr. W. P. Lett will read a paper upon the Beaver and the Report of the Zoological Branch will also be read.

For Jan. 29, there is a very full programme. The report of the Ornithological Branch will be read by Mr. W. A. D. Lees. Mr. A. J. Kingston will read a paper on the Chimney Swift, and Mr. Willimott of the Geological Survey Department will deliver a lecture upon Canadian Gems. This will be fully illustrated by an exhibit of native gems, cut and uncut.

MONDAY AFTERNOON LECTURES.

The inaugural lecture of the Monday afternoon series is to be delivered on January 12, when Miss Margaret A. Mills will speak on the Value of the study of Natural History. Knowing Miss Mills's ability to treat this subject, we can promise a most pleasant afternoon to all who avail themselves of this opportunity of hearing Miss Mills speak, and we trust that not only this but all the lectures in these free lecture courses may be largely attended. On the following Mandays in this month, lectures will be delivered upon Botanical subjects ; on January 19th on "The Geographical Distribution of Plants," by Prof. J. Macoun, and on January 26th on "The Educational Value of Botanic Gardens," by Mr. J. Fletcher.

MONDAY AFTERNOON LECTURE.—No. 1.

THE STUDY OF NATURAL HISTORY.

By Miss Margaret A. Mills.

(Read Jan. 12, 1891.)

The term Natural History, should be used to include the study of all natural objects whether they are possessed of life, or, give no evidence of vitality. The phenomena of the inorganic world are the special concern of the geologist and mineralogist. The phenomena of the nature and relations of all bodies which exhibit life, are known as the science of biology, which is subdivided into two main classes—botany which deals with plants, and zoology which treats of animals. This general application of the term is often narrowed so that Natural History includes zoology alone. The science of Botany includes everything relating to the vegetable kingdom whether in a living or fossil state. It takes a comprehensive view of all plants, from the minutest microscopic growth to the vast productions of the tropics. From earliest times this study has been much more rationally treated than zoology. It has always been understood as embracing not only the study of the external form of plants, their systematic classification and their geographical distribution, but also that of their minute structure and the processes of nutrition and reproduction. The botanist has studied from his garden of living specimens, and from his hot-house, in which could be reared under the proper conditions necessary for their development, plants from the seeds obtained from foreign lands.

On the contrary, the zoologist had no such aid, and for centuries had to limit his researches and observations to the skeletons and dried skins of birds and animals, or the collections of the traveller or sportsman. It was only in the past century that a knowledge of the preservation of the entire specimen in alcohol was learned. Thence its development and progress has been delayed, not from any lack of interest in the subject, but from a dearth of the facilities and aids which had so assisted the sister science—botany.

A history of zoology and botany must take account of the growth of the various kinds of information acquired in past ages through the labors of a long series of enthusiastic and ardent lovers of nature who, in succeeding periods, carefully noted and accurately arranged and tested their observations, until we inherit as their descendants, the rich legacy of the accumulated lore of ages.

The infancy of Natural History was the recognition of surrounding objects, and the eager, childish desire to understand their relationships to God and man. Stories of animals from deep seas or foreign lands were treasured with wonder and delight, and this age of universal credulity known as the "legendary," was succeeded by that of the collectors and travellers who were able to refute or confirm, by their own observations, so much that was doubtful.

The great instinctive desire of the heathen and savage to worship the natural in his surroundings, who saw his deity in the sun or in the mighty rushing waters, or seemed to feel the supernatural in some living creature, must have been an evidence of God working in him for his development.

A knowledge of botany has existed from the earliest times, for the plants that so beautify the globe must have ever attracted mankind's notice. The wise Solomon "spake of trees," and the Egyptians and Greeks are known to have been the early cultivators of plants for their medicinal virtues. Aristotle, the great mind of Greece and the leader in all intellectual culture of his time, was especially a Naturalist, and his work on Natural History is not only a record of his own investigations but of all preceding knowledge in this department. He refers his readers to illustrations in anatomical text-books which seem to have been in familiar and general use 2,000 years ago. Pliny, of the Romans, added scarcely a fact to Aristotle's store.

A history of plants was written by Theophrastus, 300 years before Christ, but Dr. Brunfels, of Berne, restored the science to Europe in the 16th century in his "History of Plants."

The 16th century, which saw the occupation of the New World and a general impetus given to learning, is rightly regarded as the starting point of the modern knowledge of natural causes and of the natural sciences. The three following centuries have made great progress in developing the truths of Natural History.

The 16th century awakening of Western Europe led to active research by means of observations and experiments, the home of which, naturally, was the universities, so at this early date the Italian universities conducted comparative anatomical inquiry into the animals next to man in the scale.

In the 17th century these experimenters began to band themselves into societies for mutual support and intercourse, and academies were founded whose philosophical spirit soon spread from such centres to the nation. At Naples, in 1650, was founded the first of such academies, which still survives and retains its name, "Academia Naturæ Curiosorum."

In 1662, "The Royal Society," of London, England, was incorporated by royal charter. A little later Louis XIV. founded "The Academy of Sciences of Paris."

The dogma of the isolated student of science was restrained, and dogmatic views were rapidly dispelled by argument and the agreement to admit as *truth* only that which was the result of observation or mathematical calculation.

The influence of these great academies in bringing together the collectors, the museum men, and the systematic anatomists, was soon felt in the field of progress of Zoology, and placed it now, for the first time, on a plane nearer the rational one from which botany had been viewed.

By an examination of the early records of the Royal Society it is noticed that marvellous relations were not permitted at its meetings, but solely demonstrable experiments or the exhibition of the actual specimen. Under the light and influence of such strict inquiry, witchcraft, alchemy, and other mediæval relics of superstition disappeared and vanished from public belief like snow before a July sun. But a host of new wonders had accumulated which were substituted, being truth demonstrable by accurate observation.

The progress of the 18th century perhaps culminated in the great Swedish Naturalist, Linnaeus, while such men as John Hunter and Ray undertook the task of examining the anatomical structure of the whole animal kingdom and classifying its members by the results of such profound study.

The invention and perfecting of the microscope in the 19th century were to the naturalist what the mariner's compass was to the navigator. It came to the aid of the comparative anatomist, when his need was the sorest and as a most potent factor in the development of the science of histology. By the use of this instrument cell-structure and the great cell theory, as propounded and advanced by Schwann and Darwin, became comprehensible.

Buffon's Natural History claims the merit of having been the first work to collect the isolated and apparently-disconnected facts of this study and present them in a popular and generally intelligible form.

An important revolution in Natural History took place from the institution of Botanic gardens, from the results of the extension of geographical knowledge, from the various scientific expeditions which were sent over the globe under such scientific spirits as Humboldt, Hooker and Darwin. A botanic garden of the Royal Dublin Society at Glasnevin was opened in 1796. Glasgow had one in 1818, and the Park and Garden at Kew were instituted in 1730. At the end of the 18th century, 1,600 botanic gardens were to be found in Europe. The most important researches in physiological botany had been made by French and German scientists, as their schools afforded facilities not found to the same extent in Great Britain.

The great Linnaeus taught zoology and botany as branches of knowledge to be studied for their own intrinsic interest. He is known to have been a judicious reformer rather than a discoverer. His influence imbued his students with ardor and enthusiasm, and they went forth to all parts of the world to try to contribute to the richness of their loved master's lore and to extend his knowledge.

Linnaeus was the first to attempt the classification of animals according to certain structural characters, and although this proved very defective, it led to much criticism, and stimulated naturalists to comprehend the important principle that internal structure, not external appearance, must determine the limits of groups or classes. The great principle of classification as now generally accepted, was first originated by the genius of the great Frenchman, Baron Cuvier (1769-1832), who made a notable advance on his predecessors, and the world owes to him the first systematic application of comparative anatomy to the study of the bones of fossil animals. Eminent as an administrator, it is as a naturalist that his memory is and will be preserved.

Linnaeus also devised a simple system of naming the objects of Natural History, by the use of a common scientific language. Each name was to consist of two parts, one to name the whole genus, the other to distinguish the species. Both he and Cuvier showed great skill in the selection of simple, significant names.

The astronomical theories of Kant and La Place, of the development of the solar system from a gaseous condition to its present form, re-acted at once on men's ideas, evolving the notion of spontaneous development in all nature, which idea, although held by the Greeks, was now to be considered under the light and knowledge of the facts gained during the past three centuries. Such men as Cuvier and Agassiz caused to spring up the science of Geology. Lyell explained the history of the earth's crust by the slow development of still existing forces.

To Darwin must be accredited the work of having abolished mysticism from the science of life, and of raising Zoology to be a science which seeks to explain all its phenomena by the application of the laws of physics and chemistry. From his life-work, one gleans that his theory of organic evolution has been based on actual mechanical force and demonstrable fact. He used the knowledge of the unscientific (the farmer and the fancier), who for centuries for practical purposes had used many biological laws. This he formulated as the laws of variation and heredity, and originated thremmatology. He also clearly propounded the theory of the survival of the fittest by showing that numbers are limited by the food supply, and in the struggle for this, a necessary selection is enforced. He also deduced the following :—That every organ,part, color and peculiarity of any organism, must either be of benefit to its possessor or have been useful to its ancestors. And finally he brought the simplest living matter known as protoplasm before the mental vision as the starting point from which all highest forms have been evolved. This principle is generally known to most people only in its sarcastic application to man's descent from the ape.

After paying the tribute of honor by naming Von Baer, Milne-Edwards, Leuckart, Hæckel, Wallace, Von Haller, Audubon, Dawson, Wilson, Huxley, Tyndall and Muller, all bright stars in the firmament of Natural History, we must leave this historic review to present some other aspects of our subject. Before dismissing them let us remember their toils along a tedious road, along which they had glimmerings of light and hope from that glorious prospect and clearer mental atmosphere which their efforts opened up for our gratification, our intellectual enjoyment and general welfare. Let us be grateful and worthy our inheritance.

Now, scientific truth is not the property of the few, for it is a part of the woof of common life, and all await the solution of the problem and mystery of existence. Since all science is tending this way it must be generally diffused, and this can be done in no better way than by making it a part of the intellectual culture afforded by our common educational systems.

There will be, as there always have been, those with particular aptitudes for the study of Nature, who will pursue it with the noble interest that its truths inspire rather than for the sake of its usefulness to humanity, but their labors are woven into the practical resources of our life. Other abilities, other qualities are required by those who use the truths and principles evolved by the scientist in their practical adaptations to man's material wants and daily uses. One is the researcher, who communes with Nature to allure from her secrets and laws which the mechanical genius readily seizes upon and incorporates in his inventions. The world is most appreciative of the latter, and showers upon him her praises and emoluments, while man in his short-sighted selfishness is too prone to forget and neglect the scientist, who is thus kept behind the scenes of the world's stage. However, such minds are recompensed by the pleasures they find in the discoveries of Nature's truths and in the assured feeling that they are bettering the condition of the masses. Those who pursue science for its own sake rather than from a utilitarian point of view should be fostered and encouraged by the Government of the land and by society's most influential classes It is from the prevailing tendency of our age to be material and practical that more assistance is not given to naturalists, and the study made more a part of the curriculum of our Public School systems. To be sure, the students of our universities have opportunities to develop scientific tastes, but they form a very small fractio of the community. We must reach the children, the young children whose minds are receptive and plastic, and whose habits are being formed. This important work can be commenced in every home, and in every school, if parents and teachers feel their responsibilities in directing aright the latent energies of those entrusted to their care.

Children are busy observers of natural objects and have many questions to ask. This is but indicative of a healthy natural state in them. Are not their inquiries often repressed instead of being encouraged and guided? Why? one asks. And must it not be answered that those in charge of the education of children, as well as parents, do not possess the information necessary to answer simply and intelligently the questions prompted by an awakening intellect. At school and at the fireside how irrationally children have been treated. They have been shut in from nature and compelled to read, write and learn much in abstractions; while Nature, the skilful teacher, awaited them abroad in her domains to give lessons in the pleasantest, easiest form, through the senses. But "a good time is coming, boys;" it has dawned upon us, and our little human buds open in and bloom in the "Kindergarten"—the child garden, where they hear and imitate the songs and movements of birds; where God and love make all things bright and happy; where the flowers, the ants, the bees, the winds, the rain, "Jack Frost" and the stars are the playmates of the children of men. But alas! too soon there comes "a biting, chilling frost" and nips or delays such an all-round development as is desired for our blossoms. It will be only when this natural, rational culture is continued through our entire school course that a right and rational method will be followed, and be productive of good results.

The moral, mental and physical are harmoniously developed under skilful guidance, for in our rambles abroad, eyes, ears and brain are busy in noting and wondering at God's greatness, His love, and His myriad wonders of Creation. The activities of youth must be directed aright, or soon a lazy, listless humor will take possession of many, and if indulged in will be productive of idle day dreams; or, worse still, the same activities and latent energies may lead into wrong and dangerous channels, where shipwreck and disaster may ruin the staunch craft which gave such bright promises when launched upon life's journey under favoúring breezes.

What responsibilities devolve upon us! Do we know them, realize them, feel them—and feeling, act; "Act in the living present"?

If mankind would awake to an examination of self; if we could throw off that sauntering humor, which as a habit lets a great part of each day, of each life, run carelessly away without either business or recreation, we might acquire much skill in many things and ways, quite apart from our proper business or vocation.

Without much knowledge of Natural Science, and without any of its technicalities, much can be done by any one, by encouraging observations and affording or presenting opportunities for the observance of many facts and phenomena, that can be easily and simply explained. The wonders of Nature are ever with us—in all seasons—in all lands, and not only delight and gratify the senses, but lead us up "through nature to Nature's God in worshipful humility, to feel the boundless power and wisdom of our Creator." The rich coats of animals, their graceful forms and movements; the beautiful variegated plumage of birds, and their sweet songs, all delight the senses; but the elevation of the intellect must follow when their wonderful construction, their uses and the part each plays in Nature's great drama, are observed and comprehended. It can never be too strongly impressed upon minds anxious for the acquisition of knowledge that the commonest surrounding objects are worthy of minute and careful attention. That man has been studying them from earliest times, and recording his interpretations of the Creator's plans, only serve to show how little has been done by comparison with what has yet to be accomplished.

Sleep, the pulsations of our heart, and such puzzling mysteries of our existence are not yet satisfactorily solved, and these problems of paramount importance to nobly endowed man, the crowning work of God on earth (standing at the top of the animal creation), have engrossed man's attention for centuries, and will continue to do so. Then think of thousands of creatures of which little is known, but that they exist, and see what a field of work is before those who may devote themselves exclusively to the facinating employment of determining their relations to their surroundings and the part they play in the economy of Nature.

Be convinced, then, there is work for all. No field is yet exhausted; no man, however great, can say I know all; no lifetime, however well spent, is long enough to solve the questions of a single subject. Many must contribute each his little store, that the genius may glean and sift new truths from the cumulation which he skilfully lays upon the foundation at that point where his predecessors left the uncompleted work when their summons came to go hence to "join the great majority."

All can help—man, woman and child—whether as the individual or as a society. For those who employ only their leisure hours, the hours of relaxation from the worries or toils of business and busy life, there is this thought, that they are aiding in the great work, and though the contribution be but a single new or rare specimen, the record of an accurate observation, the relation of some true anecdote, or a new psychological inference, he may be furnishing a missing link in some complex chain, some thought that may be crystallized into, and vitalized anew along with the life-long labors of some genius, or he may be furnishing the keystone to some uncompleted structure. Pursued at home, or when visiting foreign countries, who can tell the result? Some strange bright bird may serve to fill an unoccupied space in the web of Nature; a fossil bone may reveal the existence of previous unknown monsters; a broken branch may disclose invaluable material for future mansions or navies; a mineral fragment may reveal a rich mine, or a geological observation may point out a new locality for coal, that indispensible aid to commerce and industry.

Business must be attended to, and some one has aptly said: "The intervals of business must be attended to." Though a man's leisure is his own, yet for his sake, as well as that of the community, it ought to be one of occupation. His pleasures and recreations ought to bear a contrasting character to his business or profession, in order to cultivate those powers of the mind that are dwarfed or unemployed during work With Natural History as a recreation of leisure hours, ennui disappears, and every step becomes enchanted ground, and a walk with an aim in view is not exercise for the body alone, but patience, minuteness and accuracy of observation, cautiousness in drawing conclusions, and in generalization, qualities most desirable in business life, are exercised, and become valuable mental discipline. Then, too, there is that forgetfulness of self, our natural selfishness is forgotten or laid aside when our thoughts are carried upward, and we become wiser and better.

The study of Nature tends to make us more social, in bringing together the different ranks and uniting them by a bond of common interest. Nature makes brotherhoods, and when banded to fish, to hunt, or in some common pursuit, men become fellows; caste and society's distinctions are ignored—man becomes the genus man; snobbery has no encouragement from Nature.

The right impressions of Nature and a cultivation of a taste for some branch of Natural History, may be made a recreation of childhood before life's more serious duties engross the energies and turn the mental, as well as the physical eye from our natural surroundings. Entomology, or the study of insects, proves particularly fascinating to the opening curiosity of children. Too often, children are taught to treat all insects as dangerous or horrible, and meriting avoidance or destruction. The sensible mother can, by her own demeanor and influence, avoid giving any such prejudice against harmless insects and easily explain why the hurtful kinds must be avoided. What ideas of beauty, of form, of coloring, of skill, of speed, of industry, and of character, can be developed from our common insects. The common fly which walks on the smooth ceiling by means of tiny suckers upon its feet; the household spider with its silken snares; the earthworm of our pavements and gardens, which turns over the soil and enriches it for man's use; the ants, many of which oppose barriers to the progress of civilization in some parts of the tropical regions, and the termites which have destroyed the written history of some provinces of South America; again the lovely butterfly that so gracefully flits about our gardens and fields—all furnish topics delightfully novel and attractive for our little ones, when wearied limbs bring them to our knee for mental refreshment. Make such a true story from Nature's fairyland of wonders, and the kindling, interested eyes, which regard you with so much pleasure, will soon make the discoveries necessary to verify your lessons, and before many years pass, their owner may repay and delight you by an extended knowledge and original work.

Books, papers and periodicals are now aiding the good work, and works on entomology, botany, ornithology, etc., are to be obtained, wherein is given in a pleasing, popular form talks on such topics without the difficult technical terms which alarm so many at the outset of these studies. Names must be learned in due time, being absolutely necessary if we are to discuss or impart our knowledge. Like money, names are but a medium of exchange. When there is the demand, the supply is soon found, and such books are on the increase. Parents will aid by placing these in the hands of the children and instructors of youth. The boys and girls can help by noticing the habits of birds, the flowering of plants, the homes and nests of insects, and in remembering to be kindly with all God's creatures, who have feelings and suffer in some degree like us, though unable to speak to us in our language, to tell the wrongs they suffer, yet their plaintive calls or agonized cries should find commiseration in our hearts. The one who inflicts torture on his inferior is a tyrant and a coward ; but to the one who prevents and alleviates suffering, the noble title of hero belongs.

Boys and girls with quick eyes and active feet can gather specimens where their elders, less nimble, fearless and active, would fail.

The young ladies, too, can help the ornithologist, who rightly grieves over the destruction of thousands of birds whose happy existence is sacrificed at the altar of fashion for the sake of their plumage, which is worn upon ladies' hats and bonnets. Would they deem it an adornment if they thought of the slaughter of the gay, pretty creatures, which people the groves and forests and make them ring with their happy songs and bright existence? No ! we answer. Ladies are kind but thoughtless on this point, and perhaps reason that it is no harm to wear the bird or a part of its plumage when it is dead, not thinking that they are fostering the trade in bird life and pandering to a cruel whim of dame Fashion. Quite a different thing is the taking of the lives of a few of these for scientific studies, and it is quite proper that the Government of the country should assist Natural History, by equipping and opening to the public, museums, suitable as receptacles for the collections which have been brought together and which are yearly increasing.

Such museums are direct public educators. Strict laws might be framed, and are in most countries, to prevent cruelty and control the avarice of man from carrying on the wholesale slaughter of birds and animals, where there is fear of the extermination of some species, or the destruction of our entire forests. They can assist, equip and encourage our devoted naturalists, whose sole aim is the amelioration of the world.

From a diversity of tastes and mental faculties, all subjects of Natural History receive due attention ; each department has its own particular value, and any advance in one does not re-act to the detriment of any other.

We find some taking great pleasure in the study of Conchology, and claiming that shells and their animal inhabitants, when compared with the other orders of creation, are inferior to none, showing in external appearance as beautiful forms or contour, as exquisite and varied tints and shades of color, and as harmoniously developed a structure and fitness for its surroundings in the animal inhabitant as are to be found in the more complicated higher classes of animals.

And Botany has always had particular charms, and our plants and flowers that so beautify and adorn the brown earth, lend their fragrant odors to delight our sense of smell, and themselves to adorn not only the body but to cultivate the æsthetic in our nature, as well as the most desirable qualities of mind. They always have ministered to our sufferings, in furnishing medicines and remedies to the healer's art. Many there are who find plants too passive to suit their mental trend, and find, in the study of ornithology that life, that sympathy which satisfies their nature, and in our country they have much new work before them, and may find inspiration from a perusal of the life of Audubon, who pursued his extensive studies under such difficulties and discouragements, yet who raised the greatest monument that Art ever gave to Nature, in his great work, "The Birds of America."

The Field-Naturalists' Club has for its composition not only scientists and naturalists, in the fullest meaning of these terms, but many who devote their leisure alone to such pleasing studies, and who imbibe much love and inspiration for the work, as well as much valuable information from the efforts of those so capable of leading and directing others on the borders of such an extensive study.

These enthusiastic leaders, whose unselfish interest in their work and untiring zeal in trying to cause others to enter upon this field of work, should be rewarded by noble *results* and a deep *feeling of gratitude* from those who have enjoyed the opportunities of listening to their lucid discourses in our winter gatherings, or to the familiar talks upon the finds of the day, when we gathered on some shady slope or grassy knoll, after a day's ramble amongst the birds and insects in our flowery fields. We are given so much knowledge--knowledge that has been attested, proved and reduced to a concise, definite form, and which we could not have gained by our own isolated efforts without the labor of reading more than one book on the subjects of botany, entomology, geology and ornithology.

In closing this feeble effort to show that the study of Natural History offers to all opportunities for its promotion as a *science*, some of the more direct advantages of its bearing on man's corporeal wants, as well as upon his mental and moral state, have been briefly noticed as being an important part with which most of us can effectively deal, and a part in which the human tendencies for a love of the marvellous, merely superficial and somewhat credulous may be influenced and directed to a healthy mental development and invigoration, by a selection of the proper mental food.

For a better treatment of the subject, I must refer you to the inaugural address by our worthy President, Dr. Ells, which you have in a printed form in the January number of the "Ottawa Naturalist," which records the transactions of "The Ottawa Field Naturalists' Club."

I've done my little for the club in this paper from a deep sense of gratitude for the great pleasure and profit I've derived from the meetings of this society and from social intercourse with its members.

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REPORT OF THE ZOOLOGICAL BRANCH, 1890.

(*Read Jan.* 15, 1891.)

To the President and Council of the Ottawa Field-Naturalists' Club :—

In making a report of the work of the Club for the past year in that branch of natural history which relates principally to the mammalia found to exist in the neighborhood of Ottawa, we cannot say that any discoveries of particular importance have been made. Many of the larger animals which were at one time quite common have completely disappeared with the cutting down of the forests and the occupation of the land by man, whilst several others are seen only at rare intervals, and these are likely also to disappear at no very distant date. Of the smaller animals, many are yet to be found, and, if new varieties are discovered at all, it will most likely be among the moles, the shrews and the little rodents.

The following is a summary of captures, etc., which have been reported :—

Mr. Evarts, of this city, caught in his house in an ordinary mouse-trap a White-footed Mouse *(Hesperomys leucopus)* in November last, and sent it to Mr. W. A. D. Lees, who in turn sent it to Mr. Whiteaves, of the Geological Survey, who had the specimen mounted. It is now to be seen in the Museum. Several mice of the same sort have been seen during the year in and about dwellings. The mouse itself is common ; but we are not aware of its having been previously reported as having taken up its abode in such places.

Mr. F. A. Saunders reports having caught in a trap in Dow's swamp, in November last, three specimens of the Red-backed Mouse *(Evotomys rutilus)*, the traps being placed under a fallen tree and baited with apple.

He also reports having seen a Red Fox in June and another one in October, besides Rabbits, Chipmunks, Red Squirrels, Musk Rats, Field and White-footed Mice, and one Flying Squirrel in July last. He further reports that he and his brother, Mr. W. E. Saunders, shot several Bats in the early part of July, among which were the Hoary Bat, the Brown and Silver-haired, and some others which they had not at the time identified. It may be said that the Hoary Bat is not very common, the other two named are abundant.

Miss Harmer reports that in October last a Black Squirrel was caught near Britannia. This Squirrel was never very numerous in this locality its habitat being more to the south and west. No report has reached us of any having been seen for several years in this neighborhood.

At the Club's excursion to Butternut Grove in early summer a Common Garter Snake was seen in the act of swallowing a goodish sized frog—the frog was at least three times the size of the snake's head. It looked like a big undertaking to persuade a frog of that size to go down head foremost into such a small hole. The reptile was left with its work half accomplished. It seemed rather cruel to leave the frog in such a horrible plight; but we justified ourselves in doing so with the thought, that if we liberated the prisoner his snakeship would only catch another one if he was not prevented from doing so. We did not want to kill the snake and were not inclined to stay and watch him and keep him from exercising the might which constitutes right in the domain of snakes and frogs,. and which perhaps is sometimes claimed by animals of a sort which are supposed to occupy a higher place in the natural world.

While no important discoveries have been made during the year, an active interest has been taken by many of the members in finding out more about the habits and peculiarities of the animals common to this and other localities. There are reasons for believing that the club is doing much good in the community by the encouragement and opportunities it affords to its members, and the people generally, for becoming better acquainted with the work in which they occupy themselves, and its never ending sources of interest and enjoyment.

Respectfully submitted,

J. BALLANTYNE, } *Leaders.*
W. P. LETT. }

SUB-EXCURSIONS TO THE GEOLOGICAL SURVEY.

No. 4.—December 13th, 1890, under the direction of Dr. George M. Dawson. A large party of ladies and gentlemen availed themselves of the opportunity of examining the collection of Indian curiosities, under the able guidance of Dr. Dawson. As a high authority on this subject, Dr. Dawson has a world-wide reputation, and in his case, the prophet is not without honour in his own country. The afternoon in the Museum was most enjoyable, and all appreciated the courtesy and patience with which all questions were answered, and the uses of the different curious objects explained.

Nos. 5 and 6.—January 10th and 24th, 1891, under the direction of H. M. Ami. The subject treated of at both of these lectures was Palæontology. At the first of these meetings, Mr. Ami gave a brief description of the fossils in the Museum from the Laurentian to the Carboniferous systems; and at the second meeting, completed the description from the Carboniferous to the Post-Tertiary. The meeting on the 24th was very largely attended, and great interest was manifested in the subject. Mr. Ami treated his subject in an able and pleasing manner and the interest was well sustained.

THURSDAY EVENING LECTURES.

On January 15th Dr. Ells delivered a most elaborate and careful paper on Asbestus. This will be published in full in a future number of THE OTTAWA NATURALIST. A very extensive and valuable collection of specimens from Canadian and foreign mines was exhibited, as well as a great variety of manufactured articles illustrative of the uses to which this valuable mineral is applied.

MONDAY AFTERNOON LECTURES.

On January 12th, the first of this series of popular lectures was inaugurated by the excellent paper by Miss Margaret A. Mills, which is printed in this number. The report of the Zoological Branch was also read. The audiences at all the lectures have been most encouraging and the council is fully satisfied that its decision to hold the lectures in the Normal School has been justified by the great increase in the attendance.

The following meetings will be held during February:—
Mondays—2nd, 9th, 16th and 23rd, at 4.15 p.m., Nomal School.
Thursdays—12th and 26th, 8.00 " "
Saturdays—14th and 28th, at 2.00 p.m., Geological Museum.

Members who have not paid their subscriptions for the current year will kindly forward them to the Treasurer, without waiting to receive personal notices from him.

ASBESTUS; ITS HISTORY, MODE OF OCCURRENCE AND USES.

(By R. W. Ells, LL.D., F.G.S.A.)

(Delivered January 15th, 1891.)

The asbestus mines of the province of Quebec are, at the present day, of special interest to the mining and industrial world, from the fact that in so far as now known they practically represent the only deposits where this mineral, of a quality adapted for spinning and for the finer purposes of manufacture, can be profitably obtained. So great are the advantages which these mines possess, particularly as regards their accessibility and the ease with which the asbestus is extracted, that unless fields as yet unknown and as easy of access can be discovered, this province will doubtless long enjoy the position of being the principal source of supply for this peculiar and important substance.

The rocks with which the asbestus veins are associated in Quebec constitute a somewhat distinct series, which have, for the last thirty years, been known under the name of the "Quebec group." They comprise an extensive and important development of both sedimentary and eruptive rocks, which extend throughout the eastern part of the province, from the Vermont boundary to the extremity of the Gaspé peninsula. They are not recognized in their entirety in any other part of Canada, though certain portions of the group are found in their extension southward into the United States. Crossing the Gulf of St. Lawrence they, however, form a very extensive belt in the island of Newfoundland, where, more particularly at certain points on the west coast, the same series of slates, sandstones, diorites and serpentines occur, the whole presenting features both from geological and mineralogical standpoints, very similar to what are seen in this portion of Canada. While these rocks in Newfoundland have, to a certain extent, been traced out, in so far at least as the entirely unsettled and unopened character of that section of the country permitted, no systematic search for asbestus has as yet been made, though, that the mineral occurs there at a number of points and in a variety of forms is clearly indicated by the specimens which have from time to time been obtained in the course of the general geological exploration of the

Island. Some of these specimens belong to the group of actinolitic minerals like the deposits found in Potton and Bolton, but among others observed from that country, were samples of vein asbestus, equalling in quality any obtained at Thetford, and having a fibre from two to three inches in length. Little attention has, however, been paid to these deposits by the people of the island, and their extent is entirely as yet, unknown. It cannot, however, be expected that this seeming indifference will long continue, in view of the rapidly increasing demand and consequent advance in prices. And it is probable that the time is not far distant when Quebec's greatest rival as a source of supply for asbestus will here be found.

While the mode of occurrence of asbestus, and, to a limited extent, its uses as well, have been known to a few, probably for the past twenty centuries, the discovery of its true economic value and of its great commercial importance are matters of quite recent date. Under the general term "asbestus," we find included several varieties of minerals, or of rock matter, some of which present startling and somewhat anomalous features. For instance, rocks as a rule, or the ingredients of mineral veins are generally regarded as possessing a weight or density several times greater than water, yet in one form, at least, of this mineral, we have a substance so light that it will float readily upon water, and has in consequence received the name of *mountain cork.* To most people, also, in speaking of rocks, minerals, or ores generally, the impression is conveyed that these are dense, heavy bodies, which can be crushed to powder with the proper application of sufficient force, yet here we have a mineral which can be pulled apart with comparative ease, teased out into fibre, and which thereupon presents the characteristic appearance of fine floss silk or cotton, so much so that in certain places this material is familiarly known by the name of cotton rock—or as the French call it, *pierre du coton.*

We have therefore here a substance which in some respects presents features belonging to both the mineral and vegetable kingdoms.

While, however, asbestus in all its forms must be styled a true mineral it possesses certain properties which distinguish it very clearly from many others. Among these presumably the most important is that of non-conductivity or its power of resisting the action of heat, in which respect it possesses some of the properties of wood, which also is in one sense a slow conductor, though in much greater perfection; since wood under the action of sufficient friction rapidly becomes charred and even ignited, whereas friction apparently exercises very little influence upon asbestus, no matter how long it may be applied. This property of non-conductivity, or of resistance to fire or heat, is one of the principal reasons for its extensive application in certain lines at the present day.

The term *asbestus* is derived from the Greek and signifies literally *inextinguishable*, while the other term frequently applied to the same mineral, viz., *amianthus*, is also of Greek origin and signifies *undefiled*, from the property possessed by the mineral of being purified by the application of flame without injury to the substance itself. This was a property well recognized by the ancients, since we read in several of the earliest authors that the custom prevailed of wrapping the dead bodies of their important personages in an incombustible cloth by which the ashes resulting from their cremation were retained intact. The process of weaving this cloth from the fibres of amianthus shews that considerable scientific skill in the textile arts had been acquired by those people, judging from the difficulty which has been experienced, even in modern applications of the art, and it is supposed that the requisite degree of tenacity was imparted by the admixture of threads of flax or silk, which could afterwards, if necessary, be removed by burning. The wicks of the lamps in the early heathen temples, which were supposed never to be extinguished, were also held to have been made of this material.

The resistant action of the asbestus fibre, or of the cloth woven from this fibre, to heat, is one of its most wonderful properties. Temperatures of 2000° to 3000° are easily withstood, while with some varieties a temperature of 5000° Fahr. has apparently produced no visible effect. Its property also of successfully resisting the action of acids is one of great value, and these properties render this substance of great importance in certain chemical operations, so much so that its use in this direction is rapidly increasing.

In addition to the cloth used by the ancients in the process of cremation, napkins were also woven and specimens of these are preserved.

in the museums of several of the cities in Italy. The old story of the table cloth of Charlemagne is doubtless familiar to many of you, in which it is stated that he used to draw this cloth from the table, all soiled with the *debris* of his feasts, and in the presence of his guests throw it upon the blazing fire, from which it was soon taken, cleansed from all impurity. This peculiarity, however, probably applies to a cloth made from the true abestus and not from the chrysotile, the difference in which will be pointed out as we proceed, but which varies from the other somewhat in composition. To the former variety, also, probably belongs the garment described in the story so quaintly given in the book by Montpetit, concerning the French *habitant*, in which he relates that at a certain lumber camp in one of our great northern forests, one of the men, newly engaged, upon his return from his day's work in the soft melting snow, when the rest of the crew were gathered about the stove, coolly proceeded to remove his boots, and then his socks which he dashed into the open fire. He, however, speedily extricated his foot gear, now cleansed to immaculate whiteness, and proceeded to dress his feet as if nothing unusual had occurred, a proceeding which, it is needless to say, among a group of people unaccustomed to witness such marvels, resulted in something stronger even than amazement, and with a sudden accession of terror at the presence of a man who could thus perform such miracles with apparently flaming garments, they incontinently fled and left the uncanny stranger undisputed master of the situation, under the impression that he could be no other than the evil one himself. Explanation was of no avail, and the men refused to return to work until the foreman had discharged absolutely the unfortunate wearer of asbestus socks.

Somewhat analogous to this is the story related to me by one of the local managers of an asbestus mine in Coleraine township. This gentleman, also, was the fortunate possessor of a pair of asbestus mittens and under the impression that these were indestructible by fire, and desirous of astonishing the crowd which was gathered around the stove in a country store proceeded to throw one of them into the flames within. The success of the wished for miracle was not, however, equal to his expectation, since upon withdrawing his mitten from the flames, after a short interval, it was found that the action of the fire had rendered the fibre so brittle that its tenacity was almost entirely destroyed, and the mitten was of no further use. In order to explain then the seeming inconsistency between the two cases, it may be stated that what is known as the Quebec asbestus of commerce, and the true asbestus, are two distinct substances, and belong to two distinct groups of minerals. Thus asbestus proper belongs to what is known as the pyroxene or hornblende group, while that obtained from the Quebec mines belongs to the talc or serpentine group. The former is classed among the igneous rocks proper, such as syenites, granites, syenites, porphyries, etc., and embraces among other varieties augite, diallage, hornblende, etc. Some asbestiform minerals are augitic, but the greater number belong to the hornblende family, and are known by several names, such as amianthus, asbestus, byssolite, tremolite, actinolite. In the variety known as pilolite, which is also a division of the hornblende group, several curious forms of asbestus occur, such as mountain paper and mountain leather, in which the fibres have become felted together in a somewhat uniform consistency, and are in the form of thin sheets; mountain or rock cork, which is a more massive form, and in which the specific gravity ranges from .68 to 1.34, and mountain wood, the name of which is derivable from its ligniform or woody aspect. The chemical composition of these several asbestiform minerals varies considerably, but for the most part they may be classed as silicates of alumina and magnesia, with varying proportions of lime and iron and occasionally a little water. The varieties known as mountain cork and leather contain a considerable proportion of water, amounting sometimes to 23 per cent.

A peculiar bluish variety known as crocidolite, and found in South Africa, Norway, and at several other points, contains a very considerable proportion of iron protoxide, sometimes as much as 35 per cent., in addition to silica, magnesia, and soda, and contains also a small percentage of water. This mineral is more properly a silicate of iron, and has great tensile strength as compared with the ordinary form of asbestus, though deficient in fire-resisting properties.

These minerals occur for the most part in serpentinous rocks in the oldest formations. In Canada, the variety known as actinolite occurs in large masses in the Laurentian rocks of Ontario, in the townships of Elzevir, Lake and Tweed.

It is also found in Norway and Sweden where rocks similar in age and character occur. The finer varieties of amianthus and asbestus occur most abundantly in the Alps of Savoy, near the boundary of Switzerland and Italy, and in the island of Corsica, at which places beautifully white silky fibre is found in considerable quantity along with much of the coarser varieties.

The variety known as tremolite is found in several countries, generally in the old Laurentian rocks, in connection with limestone. It consists of long prismatic crystals of white, grey and green colors. but has not the fine fibrous texture of amianthus or chrysolite, and it frequently graduates into actinolitic forms. It occurs in the Laurentians of Canada and New York where it has been mined for some years to a limited extent. Cork, leather, &c., are also found in rocks of the same horizon, and beautiful specimens of the former are obtained from the township of Buckingham, in Quebec. The preceding minerals belong to what is styled the group of the anhydrous silicates in which water is supposed, for the most part, to be wanting.

Of the other varieties, belonging to the talc and serpentine group we find water entering into their composition to a very appreciable extent, and they are therefore placed in the group of the hydrous silicates of magnesia. These include talc, soapstone, or stearite, potstone serpentine and a number of other kinds, somewhat similar but not economically important. The composition of all these may be generally stated to be silica, magnesia and water, with occasionally a little alumina and iron, the percentage of water, ranging from 2½ to 5, in talc, to 12½ and 15 in serpentine, so that the distinction between the two groups, the hydrous and the anhydrous, is, in this way, clearly marked. While the composition of talc, soapstone and serpentine is to a great extent the same, or with the ingredients in slightly varying proportions, the mineral which we call asbestus in Quebec, but whose true name is chrysolite, is confined almost entirely to the latter. The serpentine itself is frequently of varying colors, being green, grey, red, yellow and brown, having a hardness of about 3 to 3½, and a specific gravity of 2.5 to 2.7. It is generally massive, but sometimes presents a banded structure and is occasionally quite slaty, being frequently marked with spots, veinings and stripes of various colors. The coarser fibrous varieties are known as picrolite and baltimorite; the fibres themselves being devoid of the soft silky character and lustre which is a peculiarity of the better kinds of the variety known as chrysolite or the asbestus of commerce.

Asbestus is therefore seen to present a great variety of forms, and in some one or more of these it is found at various places over the greater part of the surface of the globe. Among these may be mentioned in Europe, small deposits in England, Scotland and Ireland; in France to a limited extent, except in the extreme southeast in Savoy, more abundantly in Italy and Portugal, and on the island of Corsica, where the beautifully silky variety, amianthus, is quite abundant. In Germany, Bavaria, the Pyernees, Russia, Norway and Sweden deposits of greater or less extent have been found.

In South Africa the peculiar bluish variety, crocidolite, has already been referred to, and recent reports state that extensive deposits of asbestus occur in the serpentine belts of Kimberley, in which the diamond diggings also are situated. Asbestus has also been found in South America, in Brazil, in Australia, and in Asia Minor. In several parts of Newfoundland, excellent fibre, more particularly of the variety known as chrysotile, is known to occur, and in the United States it is also found in connection with the serpentinous rock of the eastern mountain range in nearly every State from Maine to Georgia On the west coast also it is reported in considerable quantity from California and British Columbia, and as far north as Alaska, while its presence in the rocks of Ontario and Quebec has been recognized for many years. With such a widely extended distribution, therefore, it would seem natural that the supply of the material should be practically unlimited. Such, however, does not appear to be the case; since in many of these places the quantity is so small as not to be available for general use, and in others the quality is such as to be economically valuable only for the inferior purposes of manufacture; while in others again the difficulties of access preclude all possibility of successful mining, for years to come at least. Prior to 1880, the greater part of the fine fibre adapted for spinning came from the mines of Italy and

Corsica, and owing to the difficulty with which it was obtained and its exceptionally fine quality commanded a very high price in the market, reaching as much as $250 to $300 per ton; but the discovery of the chrysotile deposits in the province of Quebec, of a quality equally well adapted for spinning as that of Italy, taken in connection with the fact that these were situated directly along a line of railway within short haulage of a shipping port, almost immediately revolutionized the industry, and has lately nearly closed the Italian mines.

Much of the so-called asbestus of these mines, however, is not adapted for spinning, and is used for the manufacture of mill-board, cements, paints, etc., as is also the output from such mines in the United States as have been working more or less constantly for the last twenty years. The output of the Quebec mines has even already had such an effect upon these that their present output is probably scarcely a tenth of what it reached ten years ago.

In Ontario, also, a large quantity of the variety known as actinolite is mined and ground at Bridgewater in Hastings county. This is used for cement roofing being mixed for that purpose with tar, the fibrous texture of the material being sufficient to allow of its felting sufficiently, but not for spinning.

The non-conducting substances available in the process of manufacture in addition to asbestus are not numerous. Among the most important probably may be mentioned *infusorial earth*, which is generally found as a white or grayish white earthy material occupying the beds of certain lakes, or under peat bogs and in deposits frequently of very large extent. In composition this earth is almost a pure silica and is composed of the siliceous shells or crusts of diatomaceous plants, spicules of sponges, &c. It is also known as tripolite and under the name of *Tripoli*, or polishing powder, is familiar to most housekeepers. The localities where infusorial earth occurs most abundantly in the States are in Virginia, where an immense bed, many feet thick, underlies the city of Richmond; and in California, where a deposit of fifty feet in depth occurs near Monterey. In Germany large deposits also are known under the name *kieoelguhr*, and much of this material used in the United States comes from that country. Numerous lake bottoms filled with this substance occur in the provinces of Nova Scotia and New

Brunswick, generally of much greater purity than the American or German earth, and it is also found to some extent in the province of Quebec.

It is extensively used for the manufacture of water-glass or soluble silica, and for the coverings of boilers and steam pipes for which purposes, owing to its great non-conductive properties, it is especially adapted. As a polishing powder it is also extensively employed, and for some years was an ingredient in the manufacture of dynamite, as an absorbent of the nitro-glycerine which enters into the manufacture of this explosive. For this purpose, however, wood-pulp has now to a large extent superseded it. In the lining of safes and for the protection of exposed portions of buildings, it is also largely used, but it can never compete with asbestus fibre in the peculiar processes to which that product is now applied.

Another non-conducting material which enters largely into competition, both with asbestus and infusorial earth, is the substance known as *mineral wool.* This is an entirely artificial preparation, and its discovery was doubtless due to the fact that a somewhat similar substance occurs in a state of nature in connection with certain volcanic eruptions, more especially in those of the Sandwich Islands, where the slaggy volcanic liquefied matter is acted upon by blasts of air and blown out into long silky fibres, which have received the name of "Pele's Hair." Mineral wool, or slag wool, is formed artificially in a somewhat similar way, viz., by subjecting a stream of molten slag from a blast furnace to a jet of steam or compressed air, by which means the slag is broken up into minute particles, generally with a small fibrous end or tail, which accumulate as they fall and resemble masses of roughly teased out cotton. The solid particles which form the head of each minute atom are subsequently detached and the finer fibres carried over into a separate chamber, when they are ready for use. This material possesses wonderful properties as a non-conductor of heat or sound, has great lightness, and is absolutely fireproof. It is extensively employed as a material for covering boilers, steam-pipes, and for lining buildings to render them fire, sound and vermin proof. While, therefore, it competes very successfully in many points with asbestus as a non-conducting substance, like infusorial earth it has not the property of being spun, and has also several objectionable features besides which interfere somewhat seriously with its universal application.

Steatite or soapstone is an excellent resistant of heat, and as an ingredient in fire-proof paint is probably quite as valuable as asbestus, while as linings for stoves, furnaces, etc., it has long enjoyed a well deserved reputation. It also enters into competition with asbestus as a loader or filler of paper stock, and for several other purposes to which the lowest grades of the asbestus waste were formerly applied, but its special use at the present day would appear to be the manufacture of a non-corrosive and fire-proof paint.

As non-conductors of heat and sound several other preparations have been invented, among which may be mentioned *wood-pulp* and *terra-cotta lumber*, the latter being principally a mixture of clay and sawdust, made into bricks like ordinary clay. This mixture possesses great lightness, especially fitting it for interior work, such as dividing walls in buildings, being both fire and sound proof, but can scarcely be said to be a rival or competitor of asbestus in many respects.

Having thus briefly reviewed the several asbestiform and other non-conducting substances, we can now proceed to the consideration of the asbestus or chrysotile deposits as they occur in Canada, and more particularly in the province of Quebec, since it is in this province that the most important developments in this mineral have taken place.

The workable asbestus of Quebec is, in so far as at present known, confined to the serpentine areas of the mountainous belt which extends through the Eastern Townships from the boundary of Vermont to the extremity of Gaspé peninsula, with the exception of certain peculiar deposits which are found in connection with the serpentinous limestones of Templeton and the Gatineau valley in the Laurentian rocks north of the Ottawa. Concerning these latter deposits sufficient development work has not yet been done to determine definitely their economic value, but the quality of fibre obtained from some of the asbestus veins of this district is remarkable for its purity or freedom from foreign substances. The serpentines of the Townships form a series of disconnected masses, generally of small extent, surrounded by igneous rock, principally dioritic, but occasionally rising through great outcrops of slates or schists. At times these serpentinous masses assume such proportions as to rank almost as mountain ridges, as can be seen in Wolfestown and Coleraine, and in Gaspé in certain parts of the Shickshock range. As pointed out last year in an excellent paper "on the serpentines of Canada," contributed by Mr. N. J. Giroux, of the Geological Survey to this club, these peculiar rocks are found in formations of different ages from the Laurentian to the Tertiary. To the latter period some of those found in British Columbia are supposed by Dr. G. M. Dawson to belong, while others are there associated with rocks of Carboniferous age. It is evident, therefore, that they have a very wide geological range; and this is seen, also, in the province of Quebec, where the serpentinous limestones north of the Ottawa are of Laurentian age, while the serpentine east of the St. Lawrence is associated with rocks of Huronian, Cambrian, and possibly even newer systems. Whether this difference in the age of the serpentine formations may have any influence on the question as to the presence or otherwise of asbestus in workable quantity is a question not yet fully ascertained, but there is some reason to suppose that the serpentines of a certain age are more productive ot chrysotile in paying quantity, than that of more recent date in this country, in the same way that the quartz veins of the Cambrian rocks appear to be the seat of more productive gold mines than those found in newer formations.

The serpentinous rocks of New Brunswick have not as yet yielded asbestus except as mere thread like veinings. These are found to belong to the Laurentian system. In Nova Scotia it has not yet been recognized, but recent investigations in northern Ontario, according to the report of the Royal Mining Commission for that province lately published, indicate the presence of fibrous asbestus in the vicinity of Lake Temogami, according to the statement of Mr. E. Haycock, in veins of considerable length. This is in rock also supposed to be of Huronian age.

The serpentine areas of the Eastern Townships may be divided into three portions, viz.: 1st, a southern, embracing the masses in Potton, Sutton, Bolton, Orford, Melbourne and Shipton, which terminates not far from the Shipton Pinnacle, south of the village of Danville, though occasional detached outcrops appear above the surface for a few miles further north; 2nd, a central portion beginning with Big

Ham mountain and extending through the townships of Ham, Coleraine, Thetford, &c., to and beyond the Chaudiere River, in which the most conspicuous and important masses are in Thetford and Coleraine; and 3rd, an eastern area which is found in the Shickshock range of Gaspé and of which the most eastern outcrop is in Mount Serpentine, on the Dartmouth River, about ten miles from Gaspé Basin.

While all serpentine rocks present certain leading features which enable them to be readily recognized by anyone familiar with their general aspect; there are in the serpentine of these three areas several marked peculiarities which serve to distinguish them quite easily. Thus the rocks of the southern area are frequently, though not always, slaty, and occur sometimes with much soapstone, or potstone, and sometimes with dolomite, and have frequently a greasy smooth aspect on the slaty surface. About Brompton Lake they are associated with great hills of dioritic rock as well as with slate, and contain masses of white garnet. Mining has been attempted at several places in these rocks, more particularly for ores of copper, which has produced some very fine hand samples, but in so far as yet worked, not in quantity to be remunerative. Veins of asbestus are seen occasionally, but these are as a rule of short fibre, either soft and pasty, or harsh and stiff, while in extent they are mostly short and gashy, and do not possess the well defined vein character of those seen in Thetford and vicinity. Near Danville, however, in a peculiar knoll-like mound of serpentine the veins of asbestus are well developed, and fibre of very fine quality and of suitable length for spinning is found in abundance. The occurrence of this mass of serpentine, rich in asbestus, in a belt which is well developed a short distance to the south, but which is there, in so far as yet prospected, almost deficient in asbestus fibre of any length, is peculiar, and serves to indicate that, even in most unlikely places, exceptional development of conditions may give place to a favorable change in the rock which may lead to the establishment of a profitable mining area.

In so far, however, as experience has determined the conditions for profitable mining, the serpentine of this southern area does not yield indications favorable to successful development; and the same remark will apparently apply to much of the serpentine found in the adjoining

State of Vermont. It is possible that much of this serpentine may be the result of alteration from dolomitic rock, or from slates which contain dolomite; whereas it is clear that much of that found in Thetford and Coleraine is an alterative product of dioritic eruptive rock, rich in olivine or some allied mineral.

The rocks of the central or Coleraine area differ as a whole from those just described in being, as a rule, much more massive, and occurring in large areas. They have associated with them deposits of chromic iron and of magnetite, as well as of asbestus. Large areas of steatite or soapstone occur also about Ham Lake, and mining for nickel was carried on in this vicinity many years ago, the quantity of this mineral obtained being, however, but small. The country occupied by these rocks is generally rough and uninviting from the agricultural standpoint, and the whole area from Ham Mountain to the northern terminus of the main belt in Thetford or at the Bull Mountain in Adstock is of this description. In character of rock the serpentine presents several varieties. Portions are hard, reddish brown weathering and very siliceous, as seen in much of that in the townships of Wolfestown and Ireland, and even in the Coleraine ridge south of Black Lake and about Lakes Caribou and Little St. Francis. In this hard siliceous serpentine, asbestus very rarely occurs, and when present is mostly of imperfectly developed fibre in short and gashy veins. Occasionally, however, seamy partings are found which at first glance and at a distance present somewhat the aspect of asbestus veins, but on closer examination reveal the existence possibly of a small parting of fibre, or sometimes only of a seam of serpentine. In certain portions of the belt these seamy partings are quite numerous, and by some prospectors are supposed to indicate the presence of workable veins, on the general principle held by many practical miners, that a vein of mineral matter always becomes larger as it is followed downward, a principle of such peculiar application that its absurdity should be apparent to anyone who has ever thought a moment on the subject.

Passing beyond or to the north-east of the great masses of serpentine in Thetford and Coleraine, detached masses, knolls, and sometimes bands of this rock crop out at intervals. These are well seen near the Chaudiere River, both in the Bras de Sud Ouest and in the Des Plants streams; but though these outcrops have been carefully prospected, nothing more than small gash veins have been found. Further to the north-east on the south side of the great dioritic mass called Moose Mountain in Cranbourne, a small outcrop of serpentine, on the bank of the Etchemin River, shows small veins of one quarter to possibly half an inch of fibre, and this is the most northerly outcrop of asbestus-bearing serpentine yet known in this belt.

The most easterly area, viz., that of the Shickshocks, is largely made up of serpentine, different in character from the rock of Thetford which we may take as our typical locality; the southwestern portion being very hard and siliceous, in contact with black hornblende schists on the north; while the eastern or Mount Albert serpentine, which is the principal area in this direction. is frequently banded with shades of reddish brown and green. In these rocks only small veins of imperfect fibre have yet been found, and the generally hard and siliceous character of much of the rock is against the presence of large deposits of the fibrous variety. In the most easterly exposure, on the Dartmouth, the serpentine is very much of the same nature as in the Shickshocks, associated with hornblende schists and containing small veins of one-quarter inch fibre of but little economic value.

It is easily seen, therefore, that the character of serpentine which is really asbestus-bearing to an extent which can be profitably worked, is confined to a comparatively limited area, and more particularly to contain portions of the townships of Thetford, Ireland, Coleraine and Wolfestown, in which localities successful mining operations have been carried on for some years. But even in these favored districts there are large portions of the serpentine belts which, in so far as yet proved, have disclosed no asbestus in quantity to be economically available. The rock carrying the merchantable asbestus is generally a greyish weathering serpentine of some shade of green on fresh fracture, generally a greyish green, in which are contained numerous small particles of iron, both magnetic and chromic, more generally the former. Serpentines that have a black, hard, chippy aspect do not apparently promise well, nor does the rock which weathers a dirty reddish brown. In the asbestus-bearing rock proper the veins of asbestus are seen without any special arrangement, intersecting the mass of the rock generally in every direction, but for the most part at a considerable angle both to the perpendicular and horizontal. Certain peculiar arrangements of these veins are, however, noted in certain areas, as at the King Bros.' mine in Ireland, where the serpentine appears to be regularly stratified almost in the manner of sandstone or quartzite in layers dipping to the northwest, and the veins of asbestus apparently follow what, in sedimentary rocks, would be regarded as the bedding planes. In several other places the veins, few in number, cut the rock in an almost horizontal position, and when found in a knoll can be traced across from one side of the hill to the other nearly on the same plane, but as a rule the veins are irregularly placed. In size they range from mere threads up to a thickness of five or six inches, though the most of the workable veins in the principal mines do not, or but rarely, exceed two and a half inches in width or length of fibre, and such veins, where the asbestus is of good quality and unbroken by partings of iron, are regarded as extra No. 1 material. There are, however, generally more small veins of one inch or less than of the larger size. Serpentines associated with talc or with soapstone, where the latter is in quantity, rarely appear to carry veins of asbestus to any extent, and such steatitic rock is not usually considered good mining ground. The Broughton mine may possibly be cited as an exception to this principle, since at this place a vein of large size of very fine fibre was found lying between serpentine and soapstone walls. As the soapstone became more abundant, however, the size of the vein rapidly became less and finally split up into small strings and became useless, and it is a fact worthy of note that at the great and profitable mines in Thetford and at Black Lake soapstone is absent from the rock mass.

As for the origin of these veins in the serpentine several theories have been advanced. In composition the vein matter is, as already mentioned, apparently the same as the containing rock, and the chrysotile is simply a fibrous serpentine. Some have supposed the veins to be formed when the mass of the rock was in a pasty state and exposed to sundry strains or twistings which produced the fibrous nature of certain portions. That the rocks have been exposed to such violent action is very evident from their present faulted character.

Others have supposed the cracks to have been formed by the cooling and shrinking of the mass from a heated and pasty state by which cracks have been formed, which subsequently became filled with asbestiform matter from below. In whatever way the fissures were caused, and it is very probable that they have been formed by the great processes of metamorphism to which the rocks were exposed in the change from dioritic matter to serpentine, the vein asbestus appears more naturally to have been produced by a process of segregation of serpentinous matter from the sides of the fissure, very much as ordinary quartz in many mineral veins is known to have been produced, the segregated or infiltrated matter gradually filling the original fissure, and meeting at or near the centre, in proof of which the presence of a comb of particles of iron is very often found occupying the centre of the vein, and quite frequently these iron grains assume sufficient size as to form a regular parting of iron ore in the fibre. In this respect asbestus veins resemble very closely mineral veins with quartz or calcite which frequently contain alternate layers of ore on either side of a central comb of crystals. The arrangement also of the fibre at right angles to the sides of the containing fissure, except where the rock has been disturbed, is confirmatory evidence in the same direction.

In some of the mines fibre of exceptional length is observed. Sometimes there are veins caught along lines of fracture and drawn out of their natural position. At other times this long fibre is, to some extent at least, due to the friction of the rock walls by the displacement of a fault. In this way the long woody fibred material, known as hornblende to the miners, but which is rather a form of picrolite, is probably produced. In the same position also, and due probably to the same cause, are the long well fibred strips of asbestus seen in some of the mines, and which at first sight might almost be taken for vein matter of exceptional length. A very peculiar form of asbestus is found on an island in Lake Nicolet, where also the coarse picrolitic variety is well seen, which consists of small concretionary pellets of asbestus containing a nucleus of serpentine and enclosed in a steatitic rock. This peculiar development was first pointed out by Mr. C. W. Willmott, and has not been recognized at any of the other mines, at least to a noticeable extent. But a still more peculiar form is that seen at the Megantic mine in Colerain, where the serpentine wall for the distance of several feet is laced with minute veins of not more than a twentieth of an inch in thickness, and presents the appearance, on fresh surfaces, of a rock regularly and evenly striped with greyish white paint. The same mode of occurrence of small veins is seen at King Bros.' mine in Ireland, and at Bellmina, and occasionally some of these smaller veins there come together and form one of workable size. This peculiarity is also conspicuous in the serpentine asbestus deposits of Templeton and the Gatineau district, although the character and age of the containing rocks are entirely distinct from those of the eastern area. In this latter place the small veins of asbestus have a thickness generally of an eighth to a fourth of an inch, with partings of light greyish serpentine of about the same thickness. These occur throughout a space sometimes of a foot or even possibly more, and enclose roughly lenticular masses of limestone, which are often of large size. Sometimes several of these detached veins coalesce and produce a large vein having a thickness of two inches of wonderfully clear fibre, which continues for a short distance and then splits up again. The same peculiarity is seen in the lower part of the large vein at the Broughton mine in eastern Quebec, where the hanging wall is soapstone.

While, therefore, indications of asbestus or chrysotile may be found at most places where serpentine rocks occur, it is, I think, very clearly established by the work of prospectors, as well as by that of the staff of the Geological Survey, that very many areas do not contain, nor are likely ever to produce, asbestus in workable quantities ; and while the greatly enhanced price of the mineral renders operative, areas which a few years ago could only be worked at a loss, it must be borne in mind that the great profit is made in the output of first-class material, rather than in third-rate asbestus. To any persons, therefore, contemplating investment in such mining areas, it is plain that the first thing to be attended to is a careful examination of the property by one not personally interested in the matter, and one, further, who has a good knowledge of the different kinds of serpentine, as well as of the conditions which should govern the occurrence of asbestus in sufficient quantity to repay the money invested. Unfortunately prospectors as a class, not only of asbestus properties but of other minerals as well, are not sufficiently well informed as to such conditions. Many are led by what they have observed in connection with mines in certain other areas, such as for instance in the case of the Cornish miner, who measures everything in a Cornish half bushel. Whereas the truth is that the profitable or economical development of minerals very frequently depends upon the presence of local phenomena or conditions which have affected certain limited areas only of the earth's surface or crust. Just what the conditions have been in the past by which the serpentine areas of Thetford and Black Lake have become so impregnated with asbestus veins of great purity and large size, while the areas a short distance to the east or west should be almost devoid of asbestiform mineral, cannot yet be conclusively settled. It is possible that the presence of the large intrusive masses of granulite, which are of more recent date than the serpentine, may have had some effect in this direction, but in that case we should expect to find at Black Lake, where these granitic masses are the most abundant, the richest deposits of asbestus. On the contrary, however, it is found that the largest and most important veins are found at Thetford where the granitic masses are comparatively small and generally confined to narrow dykes; for while the serpentine of this area is, according to the best testimony on the subject, due to an alteration of igneous or dioritic rocks, we can scarcely suppose that the asbestus itself is of igneous origin. While, therefore, the reason why the Thetford areas are the most productive of fine asbestus fibre has not yet been satisfactorily ascertained, we have been able to learn some facts from the study of these Thetford mines, which are of value to guide the prospector or the scientific explorer in the search for other deposits.

Since the asbestus veins occur throughout the mass of the rock and come directly to the surface where exposed, as in the hill at Thetford mines and the great escarpment to the south east of Black Lake station, the mining of the mineral does not follow the methods which are usually employed in the working of other mines, viz., by underground slopes and levels connected with the surface by shafts, but is simply open quarry work, the entire rock being removed, broken up and the veins of asbestus separated by hand cobbing, in so far as the size of the veins will warrant the expenditure of labor for this purpose. The bulk of the barren serpentine necessary to be removed in order to obtain a ton of fibre is consequently very great, and while no exact data are to hand by which the relative proportion of asbestus and serpentine can be determined, it has been estimated to range in the ratio of 25 to 1 in very prolific ground, to 50 to 1 in ordinary mining. Of course in such a great quantity of waste rock, under the present system of working, many small veins or portions of veins are not removed, owing to the expense and difficulty attending such operations by hand labor only—and the great heaps of waste material have accumulated till they now occupy large areas of valuable ground. As in the case of the drilling and hoisting, however, where hand labor has been obliged to give place to steam and compressed air, so, also, very shortly the breaking and cobbing must also be done by machinery, and with proper appliances, with a great saving of expense, as has resulted in the case of the drilling and other operations; since with a properly equipped mine the cost of production can be reduced from 50 to 75 per cent. from the expense due to the laborious system of hand labor.

The history of asbestus mining presents some points of interest in view of the rapid growth of the industry. Comparatively little importance was attached to the mineral, from the economic standpoint, in the early days of the Geological Survey's operations, and this combined with the fact that, although asbestus had been known before 1850 in the serpentines of the Eastern Townships, the quantity seen at the places where discovered was very limited, and led to the result that but little heed was paid to its occurrence. In 1877, owing to the burning off of the forest in Thetford and Coleraine townships, the hills of serpentine became laid bare and the weathering speedily produced the peculiar felting of the asbestus fibre on the surface wherever veins occurred. This was observed by a French Canadian named Fecteau, it is stated, and the importance of the new material was soon ascertained, which resulted in the establishment of mining operations on a small scale in the summer of the following year, by the Johnston Asbestus Mining Company, although the credit of the first attempt at working should probably be given to the Ward Brothers. The areas in the immediate vicinity were speedily secured and new mines located, since which time the growth of the industry has been constant and rapid, the output increasing from 50 tons only in 1878 to probably not far from 8,000 tons in 1890, while the prices have also advanced within the last year or two at a like wonderful rate, till now No. 1 Quebec asbestus commands probably as good a price in the market as the best Italian, while No. 3 brings nearly as much as was obtained for No. 1 six years ago.

According to the Ontario Commission's Report, actinolite mining in that province was commenced in 1881, since which time about 3,000 tons have been extracted. This material, however, does not command the price of the Thetford mineral, selling at about the same figure as the waste or No. 4 from that locality, it being used almost entirely for asbestus roofing, for which purpose it is mixed with tar, as already stated, and then applied in a coating of about half an inch in thickness. The waste from the mines of the Eastern Townships, and formerly the output graded No. 3, was at one time quite extensively used for the same purpose.

The asbestus of Templeton was probably first mined in 1883, but the industry has never proved very remunerative, owing to the limited nature of the deposit and the smallness of the veins, so that for some years mining was entirely abandoned. During the last season, however, operations have been started anew, and some very excellent fibre taken out, it is claimed at a profit. The conditions under which the asbestus occurs in this district are distinct from those which are found both at Kaladar in Ontario and in the serpentine areas of the Eastern Townships, the serpentine in which the asbestus veins occur being intimately associated with crystalline limestone, and in many places the latter is highly serpentinous. The fibre of the asbestus is distinguished from that of Thetford in having a marked pearly and wavy lustre, in being generally lighter colored, and by an entire absence of impurities in the form ot iron grains. Sufficient study of these peculiar rocks has not yet been made to pronounce definitely upon their probable importance, but when the deposits are made more accessible considerable mining will be done, as these appear to be quite extensive.

As for the uses of asbestus, these have multiplied with exceeding rapidity. The early history has been briefly stated, in so much that sufficient acquaintance with its peculiarities had been learned many centuries ago to enable it to be woven into cloths often of considerable size. At the present day the finer grades and longest fibres are still somewhat extensively used for weaving into cloths, from which drop curtains for theatres, suits of clothing for firemen, and various other articles, are made, among which are asbestus mail bags for railway transit. So important is the matter of fire protection in theatres now regarded in the leading cities of Europe and in the United States, that special legislation has decided that asbestus curtains of a size sufficient to completely shut off the stage from the body of the house must be a part of the stage furniture. As an instance of what can be woven from this material, it may be mentioned that the curtain of the Academy of Music, Philadelphia, by which the stage is separated from the body of the house in case of fire, is 54 feet wide and 53 feet high, and is made almost entirely of pure asbestus, only 3 per cent. cotton being employed, presumably to facilitate the weaving.

As a protection for firemen asbestus clothing has been proved to be of the greatest advantage. By its aid they have been able to enter burning buildings and approach so closely to the flames as to extinguish them in a much more speedy manner than by the old plan of fighting them at a distance. Of a somewhat similar character are the fire shields, also made of asbestus, which are placed between the burning building and those who are fighting the flames, thus protecting them largely both from the great heat and from the dense volumes of smoke as well. As for the great heat which can be endured when clad in these garments, the story of the extinguishing of the Coste gas well in western Ontario only last year is quite fresh in our memories. Here the huge jet of gas which issued from the stand-pipe of the well became ignited, and the screw-cap which closed the pipe having received some injury could not be adjusted so as to effectually close the orifice. Several expedients were resorted to in order to arrange the cap successfully, till at last, under promise of a heavy reward, some one, clad in an asbestus suit, boldly approached the flame itself, a thing absolutely impossible without the protection thus afforded, adjusted the cap properly, screwed it on and extinguished the ignited gas. But while the use of this material for the purpose of clothing has steadily increased within the last ten years, so many other needs have arisen to which it appears especially adapted, that the manufacture of clothing is forced to take a comparatively unimportant place. Thus in chemical laboratories fine asbestus cloth, or even finely teased out asbestus fibre, is now used very extensively for filtering various solutions for which no other material yet discovered has been found so well adapted, especially for strong acids and alkalies which would quickly destroy the ordinary filtering paper. The advantages of the asbestus filter are also apparent in the fact it can be ignited without being consumed. It is also rapidly coming into use in sugar refineries for filtering the saccharine juices, and as a filter for water it has been found to possess very superior qualities over most of the substances in use, and will doubtless, before very long, become an important agent in the purification of our supply of water in large cities.

Its value as an ingredient in the manufacture of fire-proof paint has already been alluded to slightly, in which respect it ranks with steatite. Applied to woodwork it is capable of successfully withstanding a very considerable volume of flame and so confining the fire to a limited space. As a material for fire-escapes also, owing to its very considerable tensile strength, it is largely made into rope, the fibres of which are sometimes strengthened by the addition of brass or copper wires, from which ladders are then made, which are practically indestructible. More recently, also, its properties as a non-conductor of electricity have been discovered and a great demand has sprung up for it in the construction of dynamos, and other portions of electrical apparatus requiring insulation. Wall paper, also, printed in ornamental colored patterns, which when applied to the walls of a room reduce the risk of conflagration to the least possible degree, are manufactured even now in considerable quantity, and even writing and fine printing papers are made which have the property of resisting destruction by fire, and though becoming altered to some extent, even then preserve the writing or printing which has been made on them. A great difficulty, however, in the former case is to give the paper a sufficiently hard and smooth glossy surface over which the pen can glide freely; but this defect will doubtless be remedied in time, and with a fire proof ink the preservation of deeds and important papers can thus be readily effected.

To those affected with cold feet a stocking or insole of asbestus cloth, which is easily made, is a sure preventive of discomfort. This article has already been manufactured by an enterprising firm and a patent taken out theron, while a thin strip, used as a cork sole, will be found highly efficacious in keeping one's feet comfortable. While, however, the uses to which this peculiar mineral appears to be adapted are manifold, possibly the most important and valuable is that to which it is now so generally applied, viz., as packings for cylinder pistons in steam engines, and for joints in gas, steam and hot air pipes. In the manufacturing of steam packing good fibre is required capable of spinning. The mineral as it comes out of the rock in vein form is first pulled apart and the fibre teased out into a woolly or silky mass. Then, by specially prepared machinery, the gritty and iron particles are carefully eliminated, since their presence would be productive of injury to the rapidly moving polished piston rods, and the resulting product, a fine fluffy substance, is then carded and spun into yarn or woven into cloth. If the former, the yarn is treated after the manner of manilla and manufactured into ropes of various sizes and shapes, as required for the different varieties of packing into which it is to be made. In order to adapt the mineral to special uses the fibres of the asbestus are frequently intermixed with fine wires of copper or brass or associated with rubber. In some varieties also finely divided graphite enters into the composition, presumably to impart greater lubricity to the material. The great value of this packing arises from the fact that it is unacted upon by steam or heat, and consequently retains its elastic properties for a very long time in comparison with the old style of hemp or rubber packings; so that now, especially since the late improvements in engines of the marine type where enormous power is developed, such satisfactory results could not probably be obtained by any other known substance.

As a covering for steam pipes and boilers it has also come into very general use, the saving in fuel and power from its application far more than repaying the cost of the material, and is estimated to be not less than 30 per cent. of the energy developed.

But it would be practically impossible in a paper of this kind to enumerate the uses to which this wonderful material is now being applied, and concerning the adaptability of which fresh discoveries are being made almost daily. The great importance attached to the deposit in the province of Quebec is seen in the fact that several of the largest companies interested in the manufacture of asbestus products have found it to their interest to secure mines of their own in this district, among which may be mentioned the Bell Asbestus Co. and the United Asbestus Co., of London, Eng., and the great German firm of the Wertheims, of Frankfort, while American firms are also largely interested in several of the mines. In spite, therefore, of the wide geographical distribution of the mineral, it is evident that the asbestus of this country has, from its excellent qualities and from the ease with which it is obtained, risen to this prominent place, and in view of the fact that the sources of supply appear to be limited, it is doubly important that in all mining operations the minimum of waste should be permitted by the employment of the most improved machinery applicable to the purposes of mining and dressing, consistent with its economical and profitable output. This view of the case is now rapidly engaging the attention of those who possess the keenest insight into the great possibilities of this industry, and rapid strides have taken place in this direction during the last two years.

I trust that sufficient has been said in this paper to show that in asbestus we have a substance which is almost unique in the mineral kingdom—a substance of such ready adaptation to such a variety of uses that its neglect for so many years seems wonderful to those who have but superficially glanced at the subject. Doubtless, however, the great expense attendant upon its use prior to the discovery of the deposits of Thetford and Coleraine, in Quebec, is largely accountable for this state of things, and as in the case of many other substances when once they have come into general use, one wonders how the manufacturing and commercial world ever got along without them. It is possible that within the capacious bosom of mother earth there are stored up other treasures of the mineral kingdom, whose uses are also unknown at the present day, but which await the fortunate coming of some clever genius to show their great importance. A very striking case in point is seen in the enormous nickel deposits of Sudbury, and, to go a little further back, in the great petroleum wells and the reservoirs of natural gas of Canada and the United States. In fact nature seems to delight in astonishing us at intervals with the production of some new material which almost revolutionizes the existing methods of work ; yet it is equally certain that, just as soon as these substances are discovered, the inventive genius of man proceeds to find out some process by which they can be utilized. It will not do, however, to conclude absolutely that, because asbestus at the present day appears to fill a want which is apparently incapable of being filled by any other known material, this condition of things will continue forever or even for any very great length of time. Scientific investigation in the various branches of manufactures and arts is progressing at so wonderful a pace that one ceases almost to be astonished at each successive and brilliant discovery. It is gratifying to know, however, that all such discoveries, whether in the domain of medicine, electricity or in any of the branches of applied science tend to the increased welfare, comfort and advancement of the human race, and to those engaged in the solution of the problems which are constantly being presented in the different fields of scientific research, the thanks of all men are due as to the world's greatest benefactors.

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THE ANNUAL MEETING.

Members are reminded that the Annual Meeting will be held on the afternoon of the third Tuesday in March (17th). It will be held in the Normal School lecture room at 4.15 p.m. The importance of every one attending the annual meeting is manifest, as matters of vital interest always turn up and the Council is most anxious that every member should consider that he has a voice in directing the management of the Club.

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The Treasurer begs to request that all members who have not already done so will pay their subscriptions before the annual meeting.

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ON NATURAL PHOSPHATES.

By J. Lainson Wills, F.C.S.

(*Delivered 12th March, 1892.*)

When your President and Treasurer did me the honour to request me to read a paper on "Phosphates" before the Ottawa Field-Naturalists' Club, I hesitated in complying.

"Phosphates" in a general way, as we employ the word in this locality, implies the crystallized Mineral Apatite, so abundant in certain parts of our Laurentian formation. The good work done by the Geological Survey, has from time to time, through its officers, kept us well informed of the localities and peculiarities of the occurence of the Canadian Apatite, by valuable contributions form the pens of Sir Wm. Logan, Sterry Hunt, Vennor, Dr. Geo. Dawson, Torrance, Dr. Robert Bell and others. At the present time, I understand that Mr. Ingall also, who has been in charge of a special study of onr Canadian Apatite fields, is about to terminate and publish his preliminary report, so with deference to his opportunities and approaching publication, I could not presume to undertake a paper purely on Canadian Phosphates or Apatites as was proposed, but thought it might be acceptable to our members here, to give their attention to a more extended and general consideration of natural mineral Phosphates, and hence the title of my paper this evening, instead of being "Canadian Apatite" is "Natural Phosphates" in a general way. My present occupation prevents me from giving much time and study to the preparation of this work, but if by some generalization of facts, we can awaken a healthy discussion and exchange of ideas, my humble attempt will not have been useless.

Natural phosphates owe their commercial value to the proportion of phosphoric element contained in them, and are employed as raw material for the manufacture of phosphatic fertilizers, being also sometimes applied in the natural and raw state direct to the soil by the farmer. They are also in demand for the manufacture of phosphorus, baking powders and some other chemical products. By far the greatest demand for them, however, is made by the manure manufacturers for agricultural requirements, and this demand is yearly increasing at a very rapid rate. The occurence of natural phosphates presents the most varied and interesting modes of formation, as may be surmised by finding their deposits, not only in nearly every geological system, but in many different series of the same system.

Now in beds which may-be, have a fresh water or marine origin, now appearing as hardened conglomerate or rocks, and sometimes as sand and loose gravel: then again in vein formation or pockets, sometimes amorphous, at other time crystallized.

In the matter of texture, colour and other physical characters, we find the same endless variation.

The origin of the demand for these phoshatized products is comparatively of recent date. It was only in the commencement of the present century that crushed bones were employed as a fertilizer in agriculture, and strange to say, only then on occount of the gelatine or organic matter they might contain.

The following curious statement which appeared in a scientific journal in the year 1830, *a propos* of the employment of crushed bones in England, exposed the ignorance on the subject at that day and reads as follows:—"As to earthy matter or phosphate of lime contained in the bones, we may disregard it. It is insoluble and indestructible, and *cannot serve as a manure*, even in damp soil, and in immediate contact with the rootlets of the plant."

The suggestion of Liebig, to treat the bones with sulphuric acid, opened a new era, to the utilisation of phosphatic materials in agriculture and the manufacture of artificial manure was soon established.

The illustrious Elie de Beaumont thus expressed himself with regard to the commencement of the mining of mineral phosphates. *"Colbert has said that France would be lost for want of forests, and everyone perceives that without coal his prediction would soon be accomplished. In his day, one would have failed to comprehend how a great country might disappear."

NATURAL PHOSPHATIC DEPOSITS.

These valuable provisions of nature are the result of various causes and agencies familiar to the geological observer and their contained phosphoric acid is mostly due to animal life; and when we say "due" to animal life we wish to imply that animal life is the assimilating and concentrative medium of pre-existing phosphoric acid: whether as sea and fresh-water shells, as fish and animal bones, as excreta of birds and saurians, etc., animal organisms have been from the beginning of life and still are, the silent but mighty laboratory of nature, never resting to collect and store up the dispersed molecules of phosphoric acid. Among such are the guano beds of recent epochs, coprolite deposits, bone beds, shell beds, etc.

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*Jean Baptiste Colbert, born 1619, Minister of Finance to Louis XIV.

Nature's operations of bringing these materials or their debris together to form whole geological areas are equally varied, but the estuaries and depressions of the sea-bottoms of the different and respective geological periods, are recognized to have been the receptacles or storehouses of these wonderful supplies. A curious disposition to concretionary action, displayed by nuclei of certain organisms to absorb and accumulate phosphatic matter, with which the ancient seas abounded, is more easily seen in its effects than explained.

Such is the origin of many odd species of nodules, some varieties of which exist in immense quantities.

The abrupt or imperceptible, but never ceasing operations of geological rearrangement, follow the afore mentioned accumulations, and we then have new forms of mineralized phosphatic matter, giving rise to conglomerates, breccias, phosphatic limestone, shells and marls, sandy and ablation deposits, etc., and most of the known natural deposits of mineralized phosphate display examples of two or more of these products. For instance, the perplexities experienced just now with some of the exploratory workings of the lately discovered Florida deposits, are chiefly occasioned by the character of these beds containing boulders, and nodules from pea size to masses of several hundred pounds in weight, fish bones, sharks' teeth and fossil bones, in fact *debris* from several geological epochs, each of these materials naturally varying in purity, and therefore also in commercial value, so that the more successful enterprises may be looked for where regular and homogenous deposits occur, or some cheap and efficient mechanical means are applied for the separation of the marketable products from the less valuable or worthless intermixtures.

The classification of natural phosphates of lime is, as remarked by Dr. Penrose in Bulletin No. 46 of the U. S. Geological Survey, "a matter attended with many difficulties, not only on account of the great variety of forms in which phosphate of lime occurs, but also because many varieties blend into one another, thus often rendering it uncertain to which class a special deposit should be referred," and he adopts the following classification, based mainly on the chemical composition of the deposits, and grouped under the headings thus :—

- Mineral Phosphates
  - Apatites
    - Fluor-Apatites
    - Chlor-Apatites
  - Phosphorites
- Rock Phosphates
  - Amorphous nodules
    - Loose nodules.
    - Cemented (conglomerates)
  - Phosphoric limestone beds
  - Guanos
    - Soluble guanos
    - Leached guanos
  - Bone beds.

We shall recognise as we proceed with the study of the various phosphatic deposits, formed during the different geologic periods, that by far the greater part owe their origin to animal or organic remains, and we shall see that as soon as the organic compounds of a guano, for example, are dissipated and resolved into their elements, we may consider that the residual products, to all intents and purposes, revert to the mineral state, in accordance with the familiar expression "earth to earth."

We pass over, for the present, the guano of various localities, which however will be observed to lie mostly within 10 to 20 degrees of the equator.

We should remember, however, that this product has attained its zenith, both as to quality and quantity, and must cede its commercial importance ultimately to the mineral resources of phosphoric acid, which are before us for our more particular consideration.

We shall find the diagram on the wall which shows the approximate geological position or age of the different phosphate deposits, very useful to our present purpose, and we will commence with the more recently formed or mineralized products.

OCCURENCE OF NATURAL PHOSPHATES IN THE GEOLOGICAL EPOCHS.

Post-tertiary or Quarternary System.

True guanos.
Crust or "leached" guanos.
West Indian and Pacific Phosphates.

Tertiary System.

West Indian Rock Phosphates.
Nassau or Lahn nodular concretions.
Suffolk Coprolites in the Red Crag and Coralline Crag. (Reposing on the Lower Eocene)
S. Carolina beds, resting upon Eocene.
Deposition of Florida phosphate debris and organic remains.
N. Carolina overlying Eocene marl.
Fundamental rock of Florida Phosphate deposits.
Clays and *debris* of Bordeaux Phosphates.

Cretaceous System.

Belgian (Liege) Hesbaye nodules.
American Alabama amorphous nodules.
New Jersey marls.
Belgian (Mons) Ciply nodules (Maestricht beds).
Somme deposits, arenaceous and nodules.
Russian "Samorod" nodules Desna-Don.
Cambridgeshire and Bedfordshire Coprolites.
French nodules of Ardennes, Meuse.
" " Montpellier and Bellegrade.

Oolitic or Jurassic System.

Bordeaux Phosphorites and nodules overlain by Tertiary (Eocene) clays and *debris.*
Algerian Phosphates.

Triassic System.

Highly phosphatic beds (between Trias and below Lias) containing exuviæ of huge reptiles as well as remains of fish and crustaceans.

Permian System.

(Appearance of reptilia.)

Carboniferous System.

(Appearance of Amphibia.)

Devonian or Old Red Sandstone.

Highly phosphatic beds in conjunction with Lower Carboniferous.
Highly phosphatised beds in Shropshire, containing oldest known remains of vertebrate life associated with crustaceans.

Silurian System.

(Appearance of vertebrata)
Welsh Bala beds. Berwyn Phosphate mine.
Lingula flags (Quebec) 40% tribasic.
Angers slates (France).
Phosphate limestone of Kentucky.
Logrosan (Spain) Phosphorities (Apatites ?)
Caceres (Spain) “
Portugal “

Cambrian System.

(Appearance of Protozoa, Mollusca, Annuloida, and Crustacea.)

Laurentian System.

Canadian Apatite.
Norwegian Apatite.

Thus at the present time, we have Mineral phosphates of lime in process of formation, and principally known in commerce as "Crust guano".

Looking at the chemical composition of average Bird guano, we find it to be composed of the following constituents :—

Moisture	15.8
Organic matter and Ammoniacal Salts	52.5
Phosphates of lime	19.5
Phosphates of Iron and Alumina	3.1
Alkaline Salts	7.6
Silica and Sand	1.5

This typical analysis is from the average of 15 samples, made by Nesbit on the Chinchas Inland Guano.

An elementary knowledge of chemistry will assist us to perceive what a large proportion of the above constituents will be leached out by water, or dissipated by prolonged exposure to ordinary atmospheric influences, especially when we remember that the organic matter above mentioned comprises uric, oxalic and phosphoric salts of alkalies and ammonia, and even about one third of the phosphates of lime is found to be soluble in water. Given a deposit of guano on a limestone soil or rock, and it is readily perceived that every shower will contribute to the steady but continual process of the transmutation of the carbonate of lime into phosphate of lime, in consequence of the discharge of the weaker carbonic acid, by the stronger phosphoric acid.

The exhausted guano then becomes phosphatic in distinction to being nitrogenous and ammoniacal ("leached"), and the subjacent limestone undergoes a metamorphosis by a double decomposition, into phosphate of lime. If the absorbing limestone is pure, the phosphate of lime formed thereby will be correspondingly pure; and on the other hand, if the calcareous base is intermixed with clay or sand or ferruginous material, the newly formed product will contain alumina, silica, oxide of iron, etc., in like proportions.

Such has been the undoubted origin of the deposits of Aruba Rock phosphate, samples of which are on the table, and which are typical of this kind of metamorphosis and will serve to illustrate many similarly formed deposits, notably those of Curaçao, Sombrera, Navassa and Redondo (in which latter case the subsoil must have been aluminous, since the mineral is a phosphate of alumina).

In some cases the phosphatic principle may have been derived from animal *debris*, such as bones.

The composition of animal bones varies somewhat, according to the animal furnishing them, and even with the particular part of the same animal, but the following analysis, expressed in 100 parts, may be taken as an average :—

	Green Bones.	Bone Ash.
Moisture Organic matter	33. (gelatine)	
Phosphate of lime	56	70-75%
Phosphate of Magnesia	3	
Carbonate of Calcium	3	
Alkaline Salts	4	
Silica		

The bones of birds are even richer in phosphoric acid than those of animals, but bones of amphibia and fish contain less than those of birds and animals.

Amongst other animal organisms rich in phosphoric acid or phosphate of lime may be mentioned certain shell fish, or rather their shell remains, notably the shells of *Lingula* and *Orbicula*, which consist for the greater part of phosphate of lime, and are found in accumulated beds in the Lower Silurian rocks, being thus described by Sir Wm. Logan (Geology of Canada, 1863) :

Those coming from the Chazy formation at Alumette Island, left after calcination 61% of fixed residue, consisting of:

Phosphate of lime	85 7
Carbonate of lime	11 7
Magnesia	2 6
	100 0

and analysis of the original material gave as follows:—

	Alumette.	Hawkesbury.	R. Ouelle.
Phosphate of lime	36.38	44.70	40.34
Carbonate of lime and some fluorine	5.00	6.60	5.14
Carbonate of Magnesia		4.76	9.70
Oxide of Iron and Alumina	7.02	8.60	12.62
Magnesia			
Insoluble	49.90	27.90	25.44
Volatile by heat	1.70	5.00	2.13
	100.00	97.56	95.37

We here observe an average of 40% of phosphate of lime. It would appear that our knowledge of the proportion of phosphatic element in similiar animal remains is very imperfect, so that upon further investigations, we may expect to meet with many other similar accumulated supplies of phosphoric acid.

Some authorities attribute a large portion of the phosphate of lime in the Charleston fields to such molluscs and principally *Lingula pyramidata*, which are found abundantly on the present coast.

CLASSIFICATION OF NATURAL PHOSPHATES.

I prefer for all practical purposes and from rational observation to modify the classification proposed by Dr. Penrose, thus :—

Apatites	Fluor-Apatites. Chlor-Apatites.
Mineral and Rock Phosphates	Phosphorites. Nodules, Coprolites. Concretions. Conglomerates. Phosphatic Limestone. Phosphatic Marls. Crust Guanos.

Guanos	Nitrogenous. Phosphatic, or "leached." Bat Guano.
Animal remains	Bone beds. Shell beds. Animal exuviæ.

We will now proceed to trace in a cursory way the commercially known deposits, commencing with the most recent, and passing stratigraphically in descending order to the more ancient formations.

GUANOS.

Guanos are of two kinds—Nitrogenous or those containing their original manurial qualities, and phosphatic or "leached," the latter being in a more or less mineralized condition by exposure to weathering.

Among the Nitrogenous guanos, we have the Peruvian, Ichaboe, Patagonian and Falkland Islands.

The phosphatic or weathered guanos include those of the Pacific or Polynesian Islands, Sidney, Phœnix, Starbruck, Baker, Howland, Jarvis, Enderbury, Malden, Lacepede and Arbrohlos Islands.

Some of these deposits are more or less exhausted, and new Islands furnishing similar products are from time to time worked.

The West Indian guanos are from Aves, Mona, Tortola.

Other South [illegible]erican are Patos Islands, Megillones, Rata.

From Africa, Saldanta Bay and Kuria Muria Islands.

Bat Guano, the product from the floors of caverns inhabited by bats, have sometimes been sent to market as a rich fertilizer. It is found notably in Cuba (W. I.) and in N. Borneo. It possesses a characteristic dark brown colour and exhibits the undigested parts of beetles wings and insect *debris*.

BONE BEDS.

These are found in nearly all sedimentary strata, from the Devonian up to the present time, but with the appearance of those remarkable reptilia in the Permian age, we find that these kinds of phosphatic provisions of nature took enormous developments, augmenting the resources previously furnished by the amphibia of the Carboniferous epoch.

Bone beds, however, in their original state have furnished little to commercial supplies of phosphatic products, except those found in the Tertiary and Quarternary ages, such as Bordeaux, Carolina, Florida and Sombrero (breccia).

SHELL BEDS.

Since these must have existed from a time well into the Paleozoic periods, or that is to say, from the Cambrian age, we may expect and do find these mollusca remains, through a wide range of systems and strata and up to recent times.

The Silurian Lingula beds are remarkable, and have been already particularized as a probable abundant source of phosphoric acid.

The Welsh Silurian beds, and the French Bellegarde and Ardennes deposits in the lower Green-sand (Cretaceous), exhibit evidence of this origin, while the Tertiary and Quaternary phosphates contain very frequently these marine and fluvatile remains as a contribution to their value in phosphate of lime.

Some very interesting specimens are on the table from the Dutch West Indies, containing from 75 to 80% of tribasic phosphate of lime, and exhibiting in some cases, one mass of shells belonging to recent times.

COPROLITES.

Owe their name to Professor Henslow, and should be applied only to the fossil exuviæ of animals. The appelation has extended itself to many rolled or gravelly products, chiefly found in the Cretaceous formation. In England they have been worked to a large extent in Bedfordshire and Cambridgeshire, where they appear in the (Neocomian) strata, between the chalk and the subjacent Jurassic system, in nodules and pebbles of size from a pea to a hen's egg, and sometimes cemented by ferruginous sand into a hard conglomerate; organic remains are present, and casts and fragments of fossils with abundance of ammonites, vegetable remains and other debris of the Jurassic epoch, (*Iguanodon* and *Megalosaurus*, etc.).

The commercial products contain from 45 to 55% phosphate of lime.

The Coprolites of Suffolk occur in the Tertiary, being in the older Pliocene (the Red Crag and Coralline Crag). They are poorer in phosphate of lime, more ferruginous and harder in texture.

France also possesses some deposits of this character at Bellegarde, near the Swiss frontier, and also at Montpellier and Avignon, yielding 54% tribasic phosphate of lime.

NODULAR, CONCRETIONARY AND ARENAÇEOUS PHOSPHATES.

These by far the most important of nature's phosphatic reserves, comprising as they do, the South Carolina deposits, the French deposits of the Somme, Ardennes and Meuse, the Belgian fields of Mons and those more lately opened up at Liege (Hesbaye). The so-called "Bordeaux Phosphates," because being formerly shipped from that port, but having their real origin in the region of Quercy, comprising portions of the departments of the Lot, Tarn and Garonne and Aveyron, also furnish a considerable quantity of nodular or phosphatic concretions of kidney shape of great purity (88%), and curious geological interest. These are well represented by specimens on the table, and coming from the crevices in the Oolitic limestones, accompanied by *debris* of Tertiary age (Eocene), the walls of the crevices or fissures being at the same time incrusted with phosphorite of a high degree of purity attaining 80% of tribasic phosphate of lime.

We must not omit here the Florida nodular beds of land and river formation, which are now enjoying such a glorious boom.

As a peculiarity of this Bordeaux phosphorite, we may mention that it contains a very appreciable proportion of iodine.

The Russian deposits, situated between the Rivers Desna and Don, occur in the Cretaceous system, at about the same horizon as the Cambridgeshire coprolites and may be described as nodular.

The Nassau or Lahn concretions in clay are of Tertiary age, and although not exhibiting signs of organic remains are generally believed to be of animal origin, they attain 60 to 75% phosphate of lime, but too ferruginous to be much in request for superphosphate manufacture.

The Belgian (Ciply) deposits, which have furnished over 150,000 tons per annum of a 40 to 50% product, are of a nodular character, although the grains are often so fine as to be considered more correctly arenaceous.

The same may be said of the very remarkable French deposits, discovered near Amiens in 1886, and known as the Somme phosphates.

These are granular or arenaceous, and to this feature as well as to their richness (65-80%) may be attributed the enormous development which they have enjoyed in such a short period, attaining the annual productien of 200,000 tons.

CONGLOMERATES AND BRECCIAS.

Phosphatic beds may also assume these characters, sometimes with the cementing material as the phosphatic element, and at others with the enclosed pebbles or angular fragments as the valuable portion for commercial supplies.

Thus the Cambridgeshire coprolite fields furnish a conglomerate of phosphatic pebbles, cemented by ferruginous sand, while in the Ardennes district (France), is found a peculiar agglomeration of granules of chlorite in a phosphatic cement, the whole yielding 40 to 45% phosphate of lime.

The Belgian (Cipley) deposits yield abundant supplies of a mass of phosphatic nodules, shells casts and fossils, cemented in a calcareous matrix, to utilize which, has puzzled the ingenuity of many an "*exploitant.*"

PHOSPHATIC LIMESTONE AND MARLS.

Are found in most strata from the Silurian epoch down to more recent time.

The metamorphosis or transmutation of earthy carbonates into phosphates, is a very simple and comparatively rapid process, and the evidence of Dr. R. Ledoux in the following description is instructive. He says in a recent article on Phosphates :—"Some clients of mine sent a ship to a coral island in the Southern Pacific to bring away a cargo of bird guano. The birds were still in countless thousands. The captain had been there for a load 20 years before, and since that time no guano had been removed. At his first visit the crew had cleaned off a space and made a house of coral rock, covering it with a sail and had used it for a shelter and storehouse while at work. On leaving, the sail was taken away and the walls and board floor left. On the return, 20 years after, there was an average depth of 20 inches over the floor—an inch a year. The underlying limestone was altered into Phosphate for a depth of several feet, but the conversion of carbonate into phosphate gradually became less perfect as depth from surface was attained."

I have observed the same effect myself taking place in the West Indies, where the surface of the coral rock is speedily converted into phosphate of lime, wherever the seabirds are in the habit of congregating.

Such indeed is the simple origin of some of the most important deposits of phosphate in that portion of the world : i. e., Curacao, Sombrero and Aruba, etc.

The prospecting and first development of the latter named island having fallen to my own care and experience, I am able to produce some interesting specimens here, illustrating very clearly the history of their formation, by examination of their fossil organisms, originally carbonate of lime (coral rock), and now seen to be, by analysis, phosphate of lime of over 80%.

The deposits of Florida and South Carolina would appear to owe much of their phosphatic wealth to *debris* of phosphatized limestones and marls.

One of nature's operations, which is a factor in enriching already-formed phosphate beds, may be here alluded to, namely, the property of spring waters (which often contain considerable proportions of bicarbonates and free carbonic acid) to disolve neutral carbonate of lime, even when presented to them in apparently as the most compact and impervious material. Such has been the origin of the many remarkable caves existing in the limestone rock formations (Cheddar, Derby, Kentucky, etc.)

This property applied to a calcareous phosphated material will, in course of time, ablate, as it were, more carbonate than phosphate, and to this action is attributed the value of many thousand tons of material, in such extensive beds as those of the Somme, Ciply, Liege, and probably of Florida.

While speaking of these beds of the Cretaceous period, I may mention the recent opening up of another similar field in France. I refer to that in the department of the Pas de Calais, which would appear to be of the same nature as that of the Somme.

APATITES.

Although crystallized phosphate of lime is found as a component of rock masses in more recent strata, yet we do not yet know of any workable deposits of this mineral before passing to the oldest of fossiliferous systems, the Laurentian.

The rocks of this formation are among the most ancient on the North American continent and probably correspond to the oldest gneiss of Scandanavia. The modes of occurence are so varied in the Canadian Apatite field, that the subject would require to be treated by itself in order to do it justice here.

We are all here familiar with how it is found, both in Ontario and Quebec provinces.

Dr. Hunt thus describes in 1884, the main features of its mode of occurence : "The deposits of Apatite are in part bedded or interstratified in the pyroxenic rock of the region, and in part are true veins of posterior origin. The gneissic rock with their interstratified quartoze and pyroxenic layers, and an included band of crystalline limestone, have a general northeast and southwest strike, and are much folded, exhibiting pretty symmetrical anticlinals and synclinals, in which the strata are seen to dip at various angles, sometimes as low as 25 degrees or 30 degrees, but more often approaching the vertical. The bedded deposits of apatite, which are found running and dipping with these, I am disposed to look upon as true beds, deposited at the same time with the enclosing rocks. The veins, on the contrary, cut across all these strata, and in some noticeable instances, include broken angular masses of the enclosing rocks. They are for the most part, nearly at right angles to the strike of the strata, and generally vertical, though to both of these conditions there are exceptions. One vein, which had yielded many hundred tons of apatite, I found to intersect, in a nearly horizontal attitude, vertical strata of gneiss, and in rare cases what appear, from their structure and composition to be veins, are found coinciding in dip and in strike with the enclosing strata."

The apatites of Norway are known since 1854, and occur on the southern coast in similar rocks to our own (Canadian), and many of the associated minerals are similar to those observed in the Laurentian rocks, the vein matter differing chiefly in freedom from carbonate of lime.

Rutile may be mentioned as an exception, which in some mines is so abundant as to form a considerable revenue to a working mine, since it is worth 1/6d. per lb., say $800 per ton. These are fluor-apatites, although they contain also some chlorine.

Continental geologists (Brogger and Rensch) who have studied these formations, have supposed them to be of eruptive origin, in consequence of the absence of phosphoric acid in the surrounding rocks, but the question seems to be most doubtful, as well here as in the case of the same opinion held on the Canadian Apatite deposits.

THE SITUATION OF CANADIAN PHOSPHATE TRADE.

Although this Canadian industry has not progressed on the same scale as many other phosphate fields, Somme, Cipley, Liege, Carolina and Florida, yet there are some facts offering an explanation for this. The peculiarity of the occurence of the mineral in vein-like formation in hard rock, calls for a scientific and economic system of mining, which has been little applied to the development of our deposits, and the cost of production is thereby more considerable than that attained in other fields of supply.

Certain centres of manure manufacture still require our high testing products to complete their standard types of concentrated supers, and the rapidly increasing demand for fertilizers by all the civilized world, both the new and the old, will tend to maintain a fair value for natural phosphates. We are getting into the era in which steam does not work fast enough, and on every hand we are seeking to accomplish our ends by electricity with lightning speed. Someone has said that the man who could made two blades of grass grow where one grew before, was a benefactor to his race, but the rush and the struggle for existence imposes that every cultivator shall be a benefactor in this regard, and carry on agricultural science at the highest possible tension for his very existence.

With increasing populations, with better means of transport, and lastly but not least, advanced scientific education, fertilizers and all other artificial means of stimulating our exhausted soils will continue to be in increasing demand.

We see no reason therefore to suppose that the mineral-phosphate Industry or phosphate mining has attained its zenith, and so far as we can see at present, the future demands of the world for phosphoric acid are destined to increase with time and agricultural progress.

RÉSUMÉ.

We may shortly generalize the foregoing facts and observations.

Of the sixty four elementary substances at present known to compose the material of our original globe, phosphorus is found to be among the twenty more abundant elements, and is recognized to have been widely disseminated in all the original and ancient rock masses. With the exception of the segregations of crystallized Apatite in the Laurentian rocks, we do not find any marked local accumulation of phosphatic bases in any of the azoic formations, or intrusive rocks.

The existence of the Eozoon Canadense is still debatable, and it is problematical whether the apatite of these older metamorphosed strata is not the mineralized product of organic remains, but passing from the Laurentian epoch to the succeeding and less altered rocks we are immediately in presence of abundant evidence of organized life, and cannot fail to remark how much more frequent are the accumulations of phosphatic beds.

The function of organized life to assimilate and concentrate the disseminated phosphoric element is strikingly apparent. The natural forces which are ever restless and continual in building up the varied geological strata of succeeding epochs (attrition, deposition, cementation, ablation, etc.) may alter and vary the manner of presentation of the phosphatic deposits which we have been considering, but the silently working power of assimilation by the organized cell, would appear to triumph over the mighty disruptive and more violent operations of nature, for the latter forces fail to re-disseminate the work accomplished by the former, but rather complete the task required to secure to man the providential supplies of phosphatic deposits with which we may satisfy our present demands, and therefore these economic supplies are seen to be chiefly in the more recent geological formations.

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ANNUAL REPORT OF THE COUNCIL FOR 1891-1892.

To the Members of the Ottawa Field-Naturalists' Club:

LADIES AND GENTLEMEN,—In presenting the customary annual report your Council has pleasure in stating that the progress of the work during the fourteenth year (which by the unscientific and superstitious might be considered an unlucky period) has been satisfactory, and that the present condition of the Club is very encouraging.

The membership continues in the vicinity of three hundred, which may be considered a very large membership for a purely scientific society

Unforeseen difficulties prevented the Excursion Committee from completing the arrangements for some of the proposed excursions, so that these popular outings were not so numerous as in former years. Two very successful ones were, however, held; the first to King's Mountain on 30th May, and the second to Montebello on 26th June, both being well attended and profitable.

Sub-excursions, or small outing parties, visited many of the neighbouring localities, and not a few more distant places. Of these may be mentioned Wakefield, High Falls, Cassleman, Moose Creek, Chats Falls, Buckingham, Mer Bleue, Aylmer, Kettle Island, Hog's Back, Templeton, Donaldson's Lake, etc. By the Botanical Report it will be observed that some of these localities yielded new plants; in entomology and ornithology many good species were also taken and observed, while the geologists discovered very interesting exposures of different formations.

The winter course of meetings consisted of six soirees; the Council having decided to omit for one year the former elementary, or afternoon lectures. The soirees were held on Thursdays in the lecture room of the Normal School, and the following papers and reports were read:—

1891.

Dec. 17.—The Work of the Geological Survey (President's Address)..................Dr. Ells.

1892.
Jan. 14.—Notes on Travel in Japan..............Mr. Harrington.
Jan. 28.—Report of the Ornithological Branch.
Report of the Botanical Section.
A Botanical Excursion to "The Chats"..Mr. R. B. Whyte.
Feb. 18.—A Microscopic Soiree with papers as follows :—
The Microscope in Entomology........Mr. Harrington.
Petrography ....Mr. Ferrier.
Forms of Animal and Plant Life in Swamp Water ....Mr. Shutt.
Feb. 25.—The Natural History of the vicinity of Lansdowne.......................Rev. C. J. Young.
Report of the Entomological Branch.
Parasitic Fungi.........................Mr. Lehmann.
Mch. 10.—Water; its properties and functions.....Mr. Lehmann.

The Librarian's Report will show that a number of valuable volumes have been bound, and that many publications have been received.

The OTTAWA NATURALIST, which has been issued regularly, and forms for the year a volume of 214 pages, contains many valuable papers and affords both to our members and to the outside scientific world a useful and appropriate record of the work of the Club.

It is particularly gratifying to state that, notwithstanding the large amount required for the publication of this monthly, the Treasurer's Report will show that there is a satisfactory balance.

In conclusion the Council desires to express its gratitude for the continued enjoyment of lecture and library rooms in the Normal School, and to tender its thanks to Dr. MacCabe, through whose courtesy this accommodation is granted.

Respectfully submitted on behalf of the Council.

W. HAGUE HARRINGTON,
Secretary.

:o:

FAUNA OTTAWAENSIS.

HEMIPTERA.

By W. Hague Harrington.

In the report of the Entomological Branch for 1890 (OTTAWA NATURALIST, Vol. V, 193) it was promised that a preliminary list of local Hemiptera would be published. The collection and study of our species has been of a very limited and fragmentary nature, and the list now submitted (with some reluctance) is correspondingly incomplete. It may, however, serve some purpose as a basis for future study of our many interesting forms, and, as few lists of Canadian Hemiptera have been published, a record of the distribution of the species enumerated. When the Abbé Provancher was publishing the third volume of his Petite Faune Entomologique du Canada, specimens of our Hemiptera were communicated by Mr. Fletcher, Mr. Guignard and the writer, and reference to his work will show that from our material he described several new species, and made a number of additions to his records.

The appearance of the present list, however, has been possible only through the kindly assistance of Mr Van Duzee, of Buffalo, N.Y., who has examined nearly all the writer's collections, and has also furnished a generic arrangement of the Homoptera, and in other ways given valuable aid. In the Heteroptera the check list of North American species published by Mr. Uhler in 1872 has been followed.

The following list contains nearly 200 species, but it only shows how much yet remains to be done before any satisfactory knowledge of our fauna is gained. The references to the relative abundance of the species, and the dates of their appearance, are given from the writer's collection, but in many instances are of small value, as these insects have not been systematically collected, but obtained when the main object of the chase was the capture of Hymenoptera and Coleoptera. The greater part of this collecting has further been in the early summer, when many of the species are immature, and comparatively little in July, August and September, when the mature insects would probably be most abundant. Our Psyllidæ, Aphidæ and Coccidæ have been omitted, for though the species are numerous and important, especially from an economic standpoint, few have been collected and determined. Let us hope that Mr. Fletcher, whose professional duties bring to his notice many of these destructive forms, may at an early date be able to prepare a preliminary list of the species.

HETEROPTERA.

SCUTELLERIDÆ.

Homæmus æneifrons, *Say*. Not common. July.
Eurygaster alternatus, *Say*. Common. May to August.

CORIMELÆNIDÆ.

Corimelæna atra, *Am. et S.* One specimen.
Corimelæna pulicaria, *Germ.* Abundant. May.

CYDNIDÆ.

Amnestus spinifrons, *Say*. One specimen.
Canthophorus cinctus, *Pal. Beauv.* Not common. May.

PENTATOMIDÆ.

Perillus circumcinctus, *Stal.* Two specimens. April.
Podisus cynicus, *Say*. Not common.
Podisus modestus, *Dallas*. Abundant. May, June.
Podisus sp. ? Perhaps var. of *modestus*. One specimen.
Neottiglossa undata, *Say*. Common. July.
Cosmopepla carnifex, *Fab*. Abundant.
Mormidea lugens, *Fab*. Common. May.
Euchistus fissilis, *Uhl.* Abundant. May.
Euchistus tristigmus, *Say*. Abundant. May.
Cœnus delius, *Say*. Common. May.
Menecles insertus, *Say*. One specimen. June 16th.
Pentatoma juniperina, *Linn.* Abundant. On pines, etc.
Peribalus piceus, *Dallas*. One specimen.
Banasa dimidiata, *Say*. Two specimens.
Banasa calva, *Say*. Not common. May 24th.
Acanthosoma cruciata, *Say*. Not common.

COREIDÆ.

Anasa tristis, *De Geer.* Two specimens several years ago.
Alydus eurinus, *Say*. Not common.

Alydus quinquespinosus, *Say*. Not common. August.

Proternor Belfragei, *Hagl.* (*Tetrarhinus quebecensis*, Prov.) Not common. August

BERYTIDÆ.

Neides muticus, *Say*. Rare. June, July.

Corizus punctiventris, *Dallas*. Not common. May.

Corizus nigristernum, *Sign.* Common. August.

LYGÆIDÆ.

Nysius thymi, *Wolff.* Abundant. May, June.

Ischnorhynchus didymus, *Zett.* Abundant. May to July

Cymus angustatus, *Stal.* Abundant. June.

Ligyrocoris sylvestris, *Linn.* Not common. August.

Pamera bilobata, *Say*. One specimen.

Ptochiomera sp. ? One specimen.

Salacis pilosula, *Stal.* Two specimens.

Trapezonotus nebulosus, *Fall.* Not common.

Peritrechus fraternus, *Uhl.* One specimen.

Eremocoris ferus, *Say*. Not common.

Scolopostethus affinis, *Schill.* Two specimens. April

Megalonotus unus, *Say*. (?) One specimen.

Peliopelta abbreviata, *Uhl.* Abundant. June, July.

Lygæus Kalmii, *Stal.* Common. July. On Asclepias.

CAPSIDÆ.

Trigonotylus ruficornis, *Fall.* Two specimens. July.

Miris affinis, *Reut.* Not common. April, May.

Leptopterna dolobrata, *Linn.* Common. June, July.

Trachelomiris (*Collaria*) Meilleurii, *Prov.* Common. July.

Resthenia insitiva, *Say*. Not common. June, July.

Resthenia insignis, *Say*. Two Specimens. June.

Lopidea media, *Say*. Not common. June, July.

Phytocoris eximius, *Reut.* One specimen.

Phytocoris pallidicornis, *Reut.* Two specimens. July 14th.

Calocoris rapidus, *Say*. Abundant. June.

Pycnopterna amœna, *Prov.* (Petite Faune Ent. III., 114, n. sp.)

Lygus pratensis, *Linn.* Abundant. April, June.

Lygus flavonotatus, *Prov.* Abundant.

Lygus sp. (Not described.) One specimen.

Coccobaphes sanguinarius, *Uhl.* Not common. July.

Pœcilocapsus lineatus, *Fab.* Abundant. June.

Pœcilocapsus goniphorus, *Say.* Very common. June, July.

Pœcilocapsus affinis, *Reut.* (Prov. Petite Faune Ent. III., 123.)

Pœcilocapsus marginalis, *Reut.* (Prov. ibid.)

Systratiotus americanus, *Reut.* Two specimens. August.

Camptobrochis grandis, *Uhl.* Two specimens.

Capsus ater, *Linn.* Very common. June.

Monalocoris filicis, *Linn.* One specimen. May 24. (High Falls.)

Pilophorus bifasciatus, *Fab.* One specimen.

Stiphrosoma stygica, *Say.* One specimen.

Labops hesperius, *Uhl.* Abundant. June. (Long-winged form rare.)

Idolocoris famelicus, *Uhl.* Not common. May, July.

Idolocoris agilis, *Uhl.* One specimen.

Rhinocapsus Vanduzei, *Uhl.* Two specimens, June 25.

Agalliastes sp. (near *associatus.*) Two specimens.

ACANTHIIDÆ

Tetraphleps canadensis, *Prov.* One specimen.

Anthocoris musculus, *Say.* One specimen.

Acanthia lectularia, *Linn.* Abundant in some localities.

TINGITIDÆ.

Acalypta Thomsonii, *Stal.* One specimen.

Corythuca arcuata, *Say.* Common.

Gargaphia tiliæ, *Walsh.* Abundant.

Physatochila plexa, *Say.* Two specimens.

Leptophya mutica, *Say.* One specimen.

ARADIDÆ.

Aradus æqualis, *Say.* (Prov. Petite Faune Ent. III., 165.)

Aradus acutus, *Say.* (Prov. ibid., 166.)

Aradus rectus, *Say.* One specimen.

Aradus sp. Several specimens of 3 or 4 species.

Aneurus inconstans, *Uhl.* Two specimens. May.

PHYMATIDÆ.

Phymata Wolffii, *Stal.* Common. August. On Solidago.

NABIDÆ.

Coriscus subcoleoptratus, *Kirby.* Common. June, July.
Coriscus inscriptus, *Kirby.* Common.
Coriscus propinquus, *Reut.* Not common. May.

REDUVIDÆ.

Sinea diadema, *Fab.* Abundant. August, September.
Diplodus luridus, *Stal.* Common.
Darbanus palliatus, *Prov.* (Petite Faune Ent. III., 182, n. sp.)
Evagoras marginata, *Prov.* (ibid, n. sp.)
Opsicœtus personatus, *Linn.* Not common.
Pygolampis pectoralis, *Say.* One specimen. May 31.

LIMNOBATIDÆ.

Limnobates lineata, *Say.* (Prov. Petite Faune Ent. III., 193.)

HYDROBATIDÆ.

Limnotrechus, n. sp.? One specimen.

SALDIDÆ.

Salda major, *Prov.* One specimen.
Salda deplanata, *Uhl.* One specimen.
Salda sp., probably undescribed. Common. (Hull.)

BELASTOMATIDÆ.

Zaitha fluminea, *Say.* Abundant.
Belostoma americanum, *Leidy.* Very common.

NEPIDÆ.

Nepa apiculata, *Uhl.* One specimen. (Leamy's Lake.)
Ranatra fusca, *Pal. Beauv.* Common.

NOTONECTIDÆ.

Notonecta undulata, *Say.* Abundant in lakes and streams.
Notonecta undulata, *Say.* *Var.* almost white. Not common.
Notonecta irrorata, *Uhl.* Not common. (Hull Brook.)
Plea striola, *Fieb.* Common. (Hull Brook and Canal.)

CORISIDÆ.

Corisa calva, *Say*. Not common.
Corisa alternata, *Say*. Abundant.
Corisa planifrons, *Kirby*. Several specimens.
Corisa Harrisii, *Uhl*. Very abundant.
Corisa trivittata, *Prov*. One specimen.

HOMOPTERA.

CICADIDÆ.

Cicada pruinosa, *Say*. Abundant.
Tibicen rimosa, *Say*. Not common.

MEMBRACIDÆ

Enchinopa binotata, *Say*. Common. August.
Campylenchia curvata, *Fab*. Abundant.
Ceresa diceros, *Say*. Abundant. July, August.
Ceresa bubalus, *Fab*. Abundant. August.
Ceresa subulata, *Say*. (?) (Prov. Petite Faune Ent. III., 338.)
Stictocephala festina, *Say*. (Prov. ibid., 237.)
Acutalis semicrema, *Say*. One specimen.
Entylia sinuata, *Fabr*. Common. June.
Publilia concava, *Say*. Not common.
Cyrtosia vau, *Say*. Two specimens.
Cyrtosia trilineata, *Say*. (? *var*. of preceding.) One specimen.
Cyrtosia ornata, *Prov*. (Petite Faune Ent. III., 240, *n. sp.*)
Atymna castanea, *Fitch*. One specimen.
Thelia univittata, *Harris*. One specimen. July 10.
Telamona unicolor, *Fitch*. Females. Common. July.
Telamona fasciata, *Fitch*. Males. Two specimens.
Telamona reclivata, *Fitch*. Not common.
Telamona sp., near monticola, *Fab*. One specimen.
Carynota mera, *Say*. Not common.
Carynota marmorata, *Say*. Two specimens.
Carynota picta, *Prov*. (Petite Faune Ent. III., 246, *n. sp.*) = *var*. of marmorata?

FULGORIDÆ.

Scolops sulcipes, *Say*. (Prov. Petite Faune Ent. III., 223.)

Cixius pini, *Fitch*. One specimen.
Cixius stigmatus, *Say*. Not common. May.
Oliarus quinquelineatus, *Say*. (Prov. Petite Faune Ent. III., 223.)
Myndus impunctatus, *Fitch*. Two specimens.
Stenocranus dorsalis, *Fitch*. Not common. May.
Liburnia pellucida, *Fab*. Two specimens. May.
Helicoptera vestita, *Prov*. (Petite Faune Ent. III., 221, *n. sp.*)
Otiocerus Degeeri, *Kirby*. (= Coquebertii, *Kirby*. Prov. ibid. 217.)
Lamenia vulgaris, *Fitch*. Not common.
Bruchomorpha oculata, *Newm*. Rare.

CERCOPIDÆ.

Lepyronia quadrangularis, *Say*. Common. July, August.
Aphrophora parallela, *Say*. Common.
Aphrophora saratogensis, *Fitch*. Two specimens.
Aphrophora quadrinotata, *Say*. One specimen.
Philæmus lineatus, *Linn*. Not common. June and July.
Clastoptera proteus, *Fitch*. Abundant. July.
Clastoptera obtusa, *Say*. Common. July.

BYTHOSCOPIDÆ.

Bythoscopus sobrius, *Walk*. Three specimens.
Bythoscopus fenestratus, *Fitch*. Two specimens.
Bythoscopus variabilis, *Fitch*. Two specimens.
Bythoscopus pruni, *Prov*. One specimen.
Pediopsis trimaculata, *Fitch*. One specimen. July.
Pediopsis insignis, *Van Duzee*. Two specimens.
Pediopsis viridis, *Fitch*. One specimen.
Pediopsis subbifasciatus, *Say*. (Prov. Petite Faune Ent. III., 292.)
Idiocerus verticis, *Say*. (Prov. ibid., 292.)
Idiocerus alternatus, *Fitch*. Abundant. May.
Idiocerus pallidus, *Fitch*. One specimen.
Agallia quadripunctata, *Prov*. Common. June.
Agallia novella, *Say*. Not common.

TETTIGONIDÆ.

Oncometopia costalis, *Fab*. Abundant. May.
Oncometopia undata, *Fab*. (Prov. Petite Faune Ent. III., 265.)

Tettigonia hieroglyphica, *Say*. Common. May, August.

Diedrocephala coccinea, *Forst.* Abundant. July, August.

Diedrocephala noveboracensis, *Fitch.* Common. July.

Diedrocephala mollipes, *Say*. Not common.

Helochara communis, *Fitch.* Several specimens. May 24. (High Falls.)

Gypona 8-lineata, *Say*. Not common. July, August.

var. flavolineata, *Fitch.* One specimen.

Gypona quebecensis, *Prov.* (?) One specimen.

Gypona albomarginata, *Woodsworth.* (= Hullensis, *Prov.*, Petite Faune Ent. III., 269, n. sp.) Three. June.

JASSIDÆ.

Ulopa, n. sp. ? Common in moss, etc. Collected in November.

Gnathodus punctatus, *Thunb.* Three specimens. May 28.

Cicadula variata, *Fall.* Not Common. July.

Cicadula sexnotata, *Fall.* (?) One specimen.

Scaphoideus immixtus, *Say*. Two specimens. July 8, 11.

Thamnotettix clitellarius, *Say*. Not common

Thamnotettix unicolor, *Fitch.* Two specimens. July 7.

Athysanus plutonius, *Uhl.* One specimen.

Athysanus, n. sp. ? One specimen.

Platymetopius acutus, *Say*. Two specimens.

Deltocephalus Sayi, *Fitch.* One specimen. June 23.

Deltocephalus configuratus, *Uhl.* One specimen.

Deltocephalus debilis, *Uhl.* Two specimens. July 11.

Deltocephalus Melsheimeri, *Fitch.* One specimen.

TYPHLOCYBIDÆ.

Typhlocyba vitis, *Harris.* *Var.* Abundant.

Typhlocyba sp. Common.

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PRELIMINARY CHECK-LIST OF THE LAND AND FRESH WATER MOLLUSCA OF CANADA.

By Rev. George W. Taylor, Victoria, B.C.

In the March number of the OTTAWA NATURALIST I published a request for information to enable me to compile a complete Check-list of the Canadian Land and Freshwater Mollusca, showing the distribution of each species.

It has since occurred to me that the gathering of records may be made easier by the publication of a *preliminary* list. This is printed herewith. It contains the names of all those species of the occurrence of which in Canada I have fairly reliable information.

It does not, however, lay claim to completeness or even to absolute correctness as far as it goes, for I have in more than one instance allowed names to remain which are most probably synonyms, and I have retained other names because they have appeared on published lists though I suspect the specimens on which such records were founded may have been wrongly identified.

Imperfect though it be the list will serve as a basis for future work, and corrections and additions can be made from time to time.

Of the 244 species here enumerated, 128 (47 Land and 40 Freshwater Univalves, and 41 Freshwater Bivalves) are on record from the Ottawa district; 57 (32 Land and 16 Freshwater Univalves, and 9 Freshwater Bivalves) are of my own collecting in Vancouver Island (19 of these being also on the Ottawa list). The remaining 79 (29 Land and 14 Freshwater Univalves, and 36 Freshwater Bivalves) are from other parts of the Dominion. Probably 20 or 30 others may be added to the list.

CHECK-LIST.

A.—Freshwater Bivalves.

1 Sphærium sulcatum, Lam.
2 " aureum, Prime.
3 " solidulum, Prime.
4 " striatinum, Lam.
5 " stamineum, Conrad.
6 " rhomboideum, Say.
7 " occidentale, Prime.
8 Sphærium patella, Gould.
9 " Vermontanum, Prime.
10 " emarginatum, Prime.
11 " flavum, Prime.
12 " tumidum, Baird.
13 " spokani, Baird.
14 " partumeium, Say.

15 Sphærium Jayanum, Prime.
16 " tenue, Prime.
17 " transversum, Say.
18 " secure, Prime.
19 " rosaceum, Prime.
20 " truncatum, Linsley.
21 " lenticulum, Gould.
22 Pisidium Virginicum, Gmel.
23 " Adamsi, Prime.
24 " compressum, Prime.
25 " variabile, Prime.
26 " abditum, Hald.
27 " ventricosum, Prime.
28 " rotundatum, Prime.
29 " occidentale, Newcomb.
30 " ultramontanum, Prime.
31 " sp.
32 " sp.
33 " sp.
34 Unio alatus, Say.
35 " asperrimus, Lea.
36 " borealis, A. F. Gray.
37 " Canadensis, Lea.
38 " cariosus, Lea.
39 " complanatus, Sol.
40 " ellipsis, Lea.
41 " gibbosus, Barnes.
42 " gracilis, Barnes.
43 " lachrymosus, Lea.
44 " ligamentinus, Lam.
45 " luteolus, Lam.
46 " multiplicatus, Lea.
47 " nasutus, Say.
48 " occidens, Lea.
49 " phaseolus, Hildreth.
50 " plicatus, LeSueur.
51 Unio pressus, Lea.
52 " radiatus, Lam.
53 " rectus, Lam.
54 " rubiginosus, Lea.
55 " spatulatus, Lea.
56 " subovatus, Lea.
57 " tenuissimus, Lea.
58 " triangularis, Say.
59 " undulatus, Barnes.
60 " ventricosus, Barnes.
61 Margaritana calceola, Lea.
62 " complanata, Barnes.
63 " margaritifera, L.
64 " marginata, Say.
65 " rugosa, Barnes.
66 " undulata, Say.
67 Anodonta angulata, Lea.
68 " Benedictii, Lea.
69 " corpulenta, Cooper.
70 " Dallasiana, Lea.
71 " edentula, Say.
72 " Ferussaciana, Lea.
73 " fluviatilis, Dillwyn.
74 " Footiana, Lea.
75 " fragilis, Lam.
76 " implicata, Say.
77 " Kennicottii, Lea.
78 " lacustris, Lea.
79 " Lewisii, Lea.
80 " Nuttalliana, Lea.
81 " ovata, Say.
82 " plana, Lea.
83 " Simpsoniana, Lea.
84 " subcylindracea, Lea.
85 " undulata, Say.
86 " Wahlamatensis, Lea.

B.—Freshwater Univalves.

87 Valvata tricarinata, Say.
88 “ sincera, Say.
89 “ pupoidea, Gould.
90 “ virens, Tryon.
91 Campeloma decisum, Say.
92 Bythinia tentaculata, L.
93 Bythinella obtusa, Lea.
94 Somatogyrus depressus, Tryon.
95 “ isogonus, Say.
96 Amnicola porata, Say.
97 “ pallida, Hald.
98 “ limosa, Say.
99 “ Cincinatiensis, Anth.
100 “ granum, Say.
101 Fluminicola Nuttalliana, Lea.
102 Pomatiopsis lapidaria, Hald.
103 “ lustrica, Say.
104 Plurocera subulare, Lea.
105 Goniobasis livescens, Menke.
106 “ salicula, Gould.
107 Limnæa stagnalis, L.
108 “ ampla, Mighels.
109 “ decollata, Mighels.
110 “ columella, Say.
111 “ lepida, Gould.
112 “ megasoma, Say.
113 “ palustris, Müll.
114 “ catascopium, Say.
115 “ emarginata, Say.
116 “ caperata, Say.
117 “ decidiosa, Say.
118 “ Adelinæ, Tryon.
119 Limnæa humilis, Say.
120 “ lanceata, Gould.
121 “ gracilis, Jay.
122 Physa Lordi, Baird.
123 “ gyrina, Say.
124 “ triticea, Lea.
125 “ ampullacea, Gould.
126 “ ancillaria, Say.
127 “ Billingsii, Heron.
128 “ heterostropha, Say.
129 Bulinus hypnorum, L.
130 Planorbis corpulentus, Say.
131 “ trivolvis, Say.
132 “ macrostomus, Whiteaves.
133 “ bicarinatus, Say.
134 “ campanulatus, Say.
135 “ opercularis, Gould.
136 “ exacutus, Say.
137 “ deflectus, Say.
138 “ albus, Müll.
139 “ nautileus, L.
140 “ parvus, Say.
141 “ umbilicatus, J. W. Taylor.
142 “ Billingsii, Lea.
143 Segmentina armigera, Say.
144 Ancylus parallelus, Hald.
145 “ rivularis, Say.
146 “ caurinus, Cooper.
147 “ fragilis, Tryon.
148 “ Kootaniensis, Baird.

C.—Land Shells.

149 Selenites concava, Say.
150 “ Vancouverensis, Lea.
151 Selenites sportella, Gould.
152 Limax agrestis, Müll.

153 Limax campestris, Binney.
154 " hyperboreus, Westerlund.
155 Vitrina limpida, Gould.
156 " Pfeifferi, Newcomb.
157 Zonites fuliginosus, Griff.
158 " ligerus, Say.
159 " intertextus, Binney.
160 " inornatus, Say.
161 " cellarius Müll.
162 " nitidus, Müll.
163 " arboreus, Say.
164 " radiatulus, Alder.
165 " indentatus, Say.
166 " minusculus, Binney.
167 " milium, Morse.
168 " Binneyanus, Morse.
169 " ferreus, Morse.
170 " exiguus, Stimpson.
171 " fulvus, Drap.
172 " suppressus, Say.
173 " multidentatus, Binney.
174 Pristiloma Lansingi, Bland.
175 " Stearnsi, Bland.
176 Tebennophorus Caroliniensis, Bosc.
177 " dorsalis, Binney.
178 Ariolimax Columbianus, Gould.
179 Prophysaon Hemphilli, Bld. & Binney.
180 " Pacificum, Cockerell.
181 Patula alternata, Say.
182 " strigosa, Gould.
183 " perspectiva, Say.
184 Patula striatella, Anth.
185 " asteriscus, Morse.
186 Helicodiscus lineatus, Say.
187 Acanthinula harpa, Say
188 Punctum minutissimum, Lea.
189 " conspectum, Bland.
190 Helix aspersa, Müll.
191 " hortensis, L.
192 " fidelis, Gray.
193 " arbustorum, L.
194 " Townsendiana, Lea.
195 " hispida, L.
196 " rufescens, Pennant.
197 " Cantiana, Montagu.
198 " thyroides, Say.
199 " albolabris, Say.
200 " dentifera, Binney.
201 " Columbiana, Lea.
202 " devia, Gould.
203 " Sayii, Binney.
204 " monodon, Rackett.
205 " Leaii, Ward.
206 " germana, Gould.
207 " tridentata, Say.
208 " palliata, Say.
209 " pulchella, Müll.
210 " costata, Müll.
211 " labyrinthica, Say.
212 Pupa muscorum, L.
213 " Hoppii, Möller.
214 " decora, Gould.
215 " corpulenta, Morse.
216 " fallax, Say.
217 " corticaria, Say.
218 " armifera, Say.

219 Pupa contracta, Say.
220 " Holzingeri, Sterki.
221 " simplex, Gould.
222 " milium, Gould.
223 Vertigo ovata, Say.
224 " Gouldii, Binney.
225 " Bollesiana, Morse.
226 " ventricosa, Morse.
227 " pentodon, Say.
228 " curvidens, Gould.
229 " Binneyana, Sterki.
230 Ferussacia subcylindrica, L
231 Succinea aurea, Lea.
232 " avara, Say.
233 Succinea Hawkinsi, Baird.
234 " lineata, Binney.
235 " Nuttalliana, Lea.
236 " obliqua, Say.
237 " Oregonensis, Lea.
238 " ovalis, Gould.
239 " Haydeni, W.G. Binney
240 " rusticana, Gould.
241 " Verrilli, Bland.
242 Onchidium Carpenteri, W. G. Binney.
243 Onchidella borealis, Dall.
244 Carychium exiguum, Say.

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ROYAL SOCIETY OF CANADA.

The Eleventh Annual Meeting of the above Society will be held in Ottawa in the beginning of June.

Fellows and Delegates will register in Dr. Bourinot's office in the House of Commons on May 31st, between the hours of 9 and 10 o'clock a.m. There will be a general meeting of the Society from 10 to 12 and at 3.30 p.m. The Presidential Address will be delivered by the Rev. Abbé Laflamme, D.D.

The meetings of Section IV—Geological and Biological Sciences—will be held in one of the Committee Rooms of the House of Commons. All meetings are open to the public, and our members are particularly invited to attend. Mr. F. T. Shutt, M.A., F.I.C., F.C.S., our First Vice-President will represent the Club officially.

PARASITIC FUNGI.

By Adolph Lehmann, B. S. A.

(Read at Microscopical Soiree, No. 2, 25th February, 1892.)

One of the many branches of science which is almost exclusively dependent on the microscope for its development, is Mycology or the study of that group of minute plants known as fungi.

This group is an exceedingly large one and, as might be expected, some of its members vary considerably in size and appearance; even more so than some of our forest trees differ from the herbaceous plants growing underneath them. A few like the mushrooms and toadstools are comparatively large; but the number of these compared with those invisible to the naked eye is so small that if the average size of the fungi could be ascertained this would not be materially increased by the former. Therefore, speaking of the group, we call it one of microscopic plants; or plants of which even the outline cannot be seen without a microscope.

In addition to great differences in size, very varied forms of structure and reproduction are found in this group; but one of the characteristics the fungi have in common is that they do not possess the peculiar green colouring matter, called chlorophyll, by which other plants are enabled to transform water and the carbonic acid of the atmosphere into starch or some closely allied compounds. Not being able to do this they must absorb them from other plants or animals or some of their products. They are, therefore either parasitic or saprophytic; the former if they draw their nutriment from living tissues, the latter if from their remains.

Nearly all the fungi have numerous slender filaments ramifying through the material on which they live. Generally this is the only portion of the plant existing in its early stage. It grows very rapidly and constitutes what is known as *mycelium.* From it, branches are sent out which, either directly or indirectly, produce minute reproductive cells called *spores.* Like the seeds of the higher plants, these serve the double purpose of multiplying and perpetuating the species. Many fungi produce two kinds of spores the one for quickly spreading its growth, the other, a resting spore, able to withstand extremes of climate, for tiding over periods unfavourable to the growth of the parent. Most spores are very small and are easily carried by the wind, as they float in large numbers in the air. Owing to this, the diseases caused by fungi spread very easily.

One of the simplest fungi is the Yeast plant (*Saccharomyces*). It possesses no mycelium, consisting simply of a single, oval cell. Spores are seldom, if, ever, formed. It reproduces itself by budding, *i. e.* by bulging out at some point till the protuberance resembles the parent cell and is separated from it by a wall. To study its growth a microscope magnifying 400 to 600 diameters and an artificially heated slide are necessary. It lives on materials containing grape sugar and has the power of splitting the latter into carbonic acid and alcohol. The manufacturer of beer is largely dependent on this lower form of life, for it transforms the sugar produced from the starch by the sprouting or malting of barley into the alcohol found in beer. But it does not assist man only in the manufacture of beer, wine, cider and other alcoholic beverages or the products, like vinegar, derived from the same; but performs an almost equally important role in the production of "the staff of life." The yeast growing in the dough gives rise to successive little bubbles of carbonic acid gas which retained by the latter till baked causes the rising of the dough and the production of a light and more easily digested bread.

A more typical fungus, the various stages of which are shown in some of the microscopes before you, is the one producing the disease known as "Rust" on the various grains and grasses. This disease, most prevalent in wet seasons on heavily manured soils, is generally first noticed by the appearance of reddish-brown spots on the leaves and stems of cereals, which rapidly multiply till the grain ripens. These spots consist of loosly attached, unicellular, oval, somewhat spiny, reddish-brown spores, which carried by the wind, birds or insects to other places, quickly germinate, producing a mass of mycelium and in turn another crop of similar spores. These successive crops of ***uredo spores***, as they are called, continue to be produced till the nutriment in the straw lessened by the ripening of the grain and the growth of the fungus is not sufficient to support a vigorous growth of the latter. The parasite then terminates its growth for the season by the production of a somewhat larger, dark brown, two-celled resting spore seen on the straw during winter in the form of dark, linear patches; such as you will find on this sample of straw. Germinating in spring both of the cells may produce short filaments bearing on the points of its several branches small gobular cells known as *sporidia*, easily transported by the wind when detached. Shortly after the leaves of the Barberries have expanded thickened patches, dotted with minute yellow spots, may frequently be seen on them. The yellow spots are clusters of a large number of spores gathered together as chains in cup shaped masses and embedded in the diseased, thickened tissues of the leaf through which the mycelium passes in every direction. These spores produced on the barberry leaf may, after being brought in contact with growing grain or grasses, again produce the red rust. This fungus absorbing the nutriment in the stem and leaves of the grain which would otherwise be stored in the seed, causes the latter, instead of being entirely filled to present a more or less small and shrivelled appearance reducing it sometimes very materially, in weight and quality.

In order to check the development or spread of injurious fungi it is important to know as much about their methods of growth and reproduction as possible. Even the knowledge that a disease is caused by a fungus may be of great value in itself, as this would make us careful to destroy or disinfect, as much as possible such materials on which these organisms might be growing. The thickenings sometimes seen on plum or cherry trees, known as "Black Knot" (caused by a fungus) should therefore not only be cut off but burned. The knowledge that the fungoid growth appearing on the leaves of the potato vines causes later on the rot of the tuber, enables us to fight this enemy before the potatoes are taken out of the ground. Much loss has also been prevented by the discovery that the disease on grains known as Smut, produced by the spores clinging to the seed grain can be overcome by soaking the grain before sowing, in a solution of copper sulphate.

The pleasure to be derived from the study of this group of plants is, therefore, not confined to seeing the beauty and harmony of nature but may be materially enhanced by discovering something of value to the human family. Many of those who use the microscope for recreation or amusement will doubtless find this a study well worth while pursuing.

ON THE SEQUENCE OF STRATA FORMING THE QUEBEC GROUP OF LOGAN AND BILLINGS, WITH REMARKS ON THE FOSSIL REMAINS FOUND THEREIN.

By Henry M. Ami, M.A., F.G.S., &c., of the Geological Survey.

(Presented to the Royal Society of Canada by Dr. G. M. Dawson, F.R.S. &c., May, 1891.)

(Abstract.)

The paper dealt with the Geological facts and grounds upon which the Quebec group rested and made it a necessary term in the geological nomenclature of strata in North America, but especially in the Province of Quebec.

The grounds, upon which the separation of the various terranes constituting this natural group was based, as well as the faunal and physical relations of its different members, were pointed out, showing the validity of the existence of such a series of fossiliferous sedimentary strata as that which Sir William Logan had recognized and Mr. Billings so clearly demonstrated early in the "*sixties.*"

The removal of the so-called Hudson River black graptolitic series of shales, etc., which are met with at Quebec City, at the west end of the Island of Orleans, along the Marsouin River, and at many other places in the Province of Quebec—at Norman's Kiln, in the State of New York, and in Penobscot County, Maine, and other places in the United States—from an uppermost position in the Ordovician System—immediately above the Utica, or just below the base of the Silurian System—was absolutely necessary in the light of facts whether palæontological or stratigraphical or in the light of other physical reasons.

The characteristics of this so-called "Hudson River" series of rocks, when studied in the field as well as in closer detail, point clearly to its intimate relation and association with the "Levis" of Sir William Logan's Quebec group. The *Levis* and the *Quebec* formations or terranes along with the *Sillery*, form a group of terranes geologically and geographically closely related, which can be divided and sub-divided

in many instances into definite zones or horizons and smaller subdivisions, all of which were deposited under peculiar conditions such as characterised the lower half of the Ordovician (Cambro-Silurian) Epoch in geology.

It will thus appear that the rocks constituting the *Quebec terrane* (which term has been used and is being adopted by many American geologists as a proper one with which to designate these so-called "Hudson River" rocks) form part and parcel of the original "Quebec Group" of Logan.

The paper went on to refer to the faunas entombed in each of these three divisions, care being taken to exclude from the list of characteristic species—such forms as were not found *in situ* or from the rocks proper of each series—whether from loose pieces or from conglomerates or conglomerate-like bands, in order that the possibilities of error in correlation as well as in palæontological or faunal differentiation might be lessened in the problem which like the present one affords such diversity of relations and complicated terms.

The paper is, in fact, a sequel to the writer's contribution read before the Geological Society of America at Washington, last December and published since. (See *Bulletin of the Geological Society of America*, Vol. II., pp. 477-502, plate 20, 1891.) Whilst the latter dealt more particularly with the region about Quebec City—the present one referred to the relations and characteristics of the Quebec Group of Logan and Billings throughout the whole extent of the Province of Quebec and contiguous districts, upon which to base the proofs for the validity and actual existence of such a group or series of terranes in that portion of North America. The equivalency of the term "Canadian Period," or "Canadian Epoch," as used by Prof. James D. Dana and others, is also adduced as further evidence, corroborative of the magnificent work performed by Sir William Logan in elucidating the complex structure of the Province of Quebec—which work with the exception of Sir William Dawson, in several papers and reports—found scarcely any advocate, whilst its factors are based upon principles and data which are as durable as the rocks from which they proceed or with which they are related.

		Terranes.		*Terranes.*
Ordovician System.	Upper	1. Hudson River,	(= Lorraine.)	
		2. Utica,	Trenton Group.	
		3. Trenton,		
		4. Black River,		
	Lower	5. Chazy,	Quebec Group.	Quebec. Levis. Sillery.
		6. Calciferous,		

The above table is given to indicate the relations of the various members of the Ordovician (Cambro-Silurian) System in Canada showing the position of the "*Quebec Terrane*" in the lower half of the system instead of being classed or grouped along with the Hudson River (= Lorraine) terrane at the very top of the system as formerly. The exact relations, stratigraphical and palæontological, which exist between the Quebec, Levis and Sillery terranes have yet to be defined. Their sequence and order in the scale of time require further investigations before this interesting fact can be ascertained on which Sir Wm. Logan and Mr. Billings were still actively engaged when called away.

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NATURAL HISTORY OBSERVATIONS.

A form for registering observations of the first and last records in Natural History has just been issued by the Royal Society of Canada. This form has been drawn up by a committee of the Royal Society and distributed to the different Natural History and Scientific Societies throughout the country. Observations are asked for upon certain well-known wild plants in all the Provinces of the Dominion, the time of sowing and harvesting grain and the ripening of wild and cultivated fruits. Then follow the arrivals and departures of birds and the most noticeable meteorological occurrences.

There is no doubt that the Royal Society will gather together by this means most valuable information. It is proposed to have the schedules collected once a year and the results laid before the Royal Society for publication in their annual Volume of Transactions.

OBITUARY.

We regret to have to record the death, on 23rd ult., at Cap Rouge, near Quebec, of the Abbé Léon Provancher, F.R.S.C., a noted Canadian Naturalist, and one of the corresponding members of the Ottawa Field-Naturalists' Club. For many years the Abbé had devoted almost his whole time to the study of the natural history of Canada (especially of the Province of Quebec) and to the publication of the results of his labours. In 1869 he began to issue the "Naturaliste Canadien," the last volume of which, No. XX., was completed in 1891. He also wrote a Flora of Canada, three volumes upon portions of the Insect fauna, a treatise upon the Univalve Molluscs, and several other works. Of the above the most important is the Faune Entomologique, in which are described many new species of insects captured at Ottawa. The types of many of these, and of the other species described by the Abbé, remain in his collection, and we sincerely hope that arrangements will be made by which this collection, which has a special value from that fact, may be deposited in some public institution and may not be either broken up and distributed, or even neglected until destroyed by insects. The Abbé Provancher was born at Becancour, Que., in 1820, and before residing at Cap Rouge was for some years Curé of Portneuf.

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EXCURSION No. 1.—TO KIRK'S FERRY.

The first excursion of the season will be held on Saturday, June 4th, to Kirk's Ferry. The excursionists will leave the Union Depot by the Gatineau Valley Railway at 9.45 a.m., *punctually*, and will be back in Ottawa at 7.30 p.m. This will give the party from 10.45 in the morning until 6.30 in the evening for collecting in this beautiful locality. It is hoped there will be a large attendance of members of the Club and their friends. The Railway Company have promised ample accomodation, and tickets may be obtained at the railway station or previously of any member of the Council, at the following rates :—

Members, adults	50 cents.
" children	25 "
Non-members, adults	60 "
" children	30 "

NOTES ON THE NATURAL HISTORY OF THE BLUE MOUNTAIN, CO. OF LEEDS, ONTARIO

By Rev. C. J. Young, Lansdowne, Ont.

(Read February 25th, 1892.)

Travellers by the Grand Trunk Railway from Montreal to Toronto have possibly noticed the rocky and broken nature of the country they pass through between Brockville and Kingston. This is especially the case in the townships of Escott and Lansdowne and in these townships it is that the subject of the present paper "The Blue Mountain" is situated. The rocky tract referred to is most pronounced in the vicinity of Charleston Lake; it extends thence in a south-westerly direction, and continuing along the River St. Lawrence, helps to form the inimitable scenery of the Thousand Islands. In past years this country was densely timbered with pine and other forest trees, and until the lumberman's axe made its onslaught on these, was, we are told, a veritable wilderness, through which the bear, the wolf and the deer roamed at will. To-day the greater part of the large timber is cut away, and in the more level places the land is cleared and cultivated, yielding some of the finest crops in this part of Ontario. In other parts, where the rocky nature of the soil forbids cultivation, a second growth has sprung up, consisting of pine, hemlock, birch, oak and poplar. Here and there patches of the old woodland remain, where the maple, the elm, the beech, and an occasional oak and hickory flourish in all their pristine vigour. But the pine are mostly gone. Besides the curiously shaped conical hill known as the Blue Mountain some six miles north of the Railway and which according to the Government Survey rises to a height of 360 feet above Charleston Lake, there are several other rocky eminences to the South, towards the river St. Lawrence, reaching an altitude of from two to three hundred feet. The whole of this country is to-day curiously diversified with woods, rocks, swamps and in places excellent farms. But it is the rocky tract known as the Blue Mountain that I am going to speak of. Almost every one now is familiar with the "Thousand Isles;" the portion that remains a wilderness extends for about ten miles on the easterly side of Charleston Lake, and varies from three to four miles in width. To lovers of nature it is a most interesting tract of country. Within these limits there is no cultivation. The larger timber, as I have stated, has been mostly cut away or destroyed by fires, but its place is taken by the dense second growth of trees above referred to. On approaching from the south, a traveller is at once struck by the extremely broken ground. On this side and on that, huge masses of rock rise up among the trees. Chaos reigns supreme and many a one well acquainted with the country who has gone out in summer to pick berries and has lingered till twilight, has failed to reach home that night. There are deep gullies and chasms between the rocks. The south side of the Blue Mountain proper is very steep, rising in terraces one above another; the outlying ridges contain steep rocky bluffs, in places bare, in others thickly wooded. Between these bluffs are swampy spots, little creeks, or here and there a marsh. In some places the chasms between the rocks are so narrow, though from. forty to fifty feet in depth, that a good sized tree that has fallen across, forms a natural bridge. Few except such as are lovers of nature or are fond of romantic scenery, with hunters and berry pickers, visit this spot. The latter are numerous in the summer months, for the ridges, as they are called, abound with blueberries, the gullies with raspberries and blackberries and the small marshes produce very fine cranberries. Near the crest of the highest ridge, running parallel with the large lake below, are two small lakelets, about half a mile long by a quarter wide. The highest of these is a romantic spot, a complete basin among the rocks. On the east side rise abruptly from the water precipitous rocks, to a height of probably a hundred feet, clothed with scrub pine and oak. The water in these lakes is said to be very deep, it is clear and cold, and on a fine day of a lovely blue. The only fish in these lakes is a species of minnow or small chub; speckled trout if introduced, I do not doubt, could thrive well. I should suppose the rugged nature of this district is due to volcanic forces, and those who know the geology of the country better than I do, will say whether it is not altogether probable that these lakelets are the craters of extinct volcanoes. Charleston Lake at the foot of these ridges is now pretty well known. It has been much frequented for some summers past by American tourists, who resort thither for the sake of sport, retirement and the pure air. The salmon trout of this lake are held in much repute, and by those who understand the method of fishing for them, are easily caught in the summer and "fall".

The American visitors are very successful, using a long line and allowing it to sink in the deep water to a depth of upwards of one hundred feet. The rocks to the east and south of the lake are of the Laurentian formation, but contain no economic mineral, at any rate none have been discovered so far. In the lake itself are islands of crystalline limestone, and on the west shore I believe both lead and iron have been found and were formerly worked.

But to return to the Blue Mountain. From its highest part the round conical hill already mentioned, a magnificent view may be obtained on a fine day. Charleston Lake stretches below, at its head is the little village of that name; a little beyond, the spire of the church at Pine Hill rises amid a grove of pine trees; to the north-west the eye ranges over a tract of rock and woodland, to the south and east is the river St. Lawrence, the fertile country intervening, and far beyond, the hills in the United States, where the limit of vision is bounded by the foot hills of the distant Adirondacks. Altogether the view is unique in this part of Ontario. But a ramble among these rocks and ridges is very tiring on a warm day, and few would care to undertake it alone.

Formerly as mentioned this region was a great resort for deer, and the older settlers tell how numerous they used to be. But within the last few years they may be said to have disappeared and now only an occasional straggler is seen. Bear too and wolves were formerly numerous; the last bear that I have heard of was seen four or five years ago by two farmers in the neighborhood, although traces of them have been since seen; and during the past "fall" three are said to have been met with near the Gananoque water some four miles from Charleston Lake. Wolves were thought to have become extinct, but in October 1887 a large one was poisoned close to the Blue Mountain. A number of sheep had been previously missed, one farmer losing as many as twenty-eight, killed, as was thought for a time, by dogs. In the partially eaten carcase of one of these strychnine was placed and thus the wolf was obtained. The person who captured it, told me of its large size, and the layers of fat he found under the skin clearly proving it had fared well on the farmer's sheep. A second one was suspected of being in the neighborhood; but none have since been seen. The lynx or wild cat, as the settlers call it, is still found among the rocks. Of the other large mammals the raccoon and fox are plentiful. Two years ago I saw four young silver-grey foxes, captured the previous summer, and which had become quite tame. They probably were the offspring of a cross between the red and black varieties, a specimen of the latter being occasionally seen. An otter is trapped from time to time in Charleston Lake ; I heard of one last year. The porcupine is a common animal, the locality being exactly suited to his requirements. In the heavier timbered places there are a few black squirrels, an occasional grey one, and other smaller animals are plentiful. With the exception of partridges, (the ruffed grouse) and some ducks, game birds are not plentiful. There are plenty of the former, but they are difficult to follow on account of the rough nature of the ground. This year they have fed eagerly on beech nuts. The spruce partridge I have not heard of Of ducks the black duck (*Anas obscura)* is very common and affords capital sport to those who are fond of hunting them during September and October. During the day time they are often found resting in the little lakes I have mentioned, where they usually find perfect quiet and seclusion. In the evening they fly down to the bays and marshes around Charleston Lake to feed. Of other ducks the wood duck, (*Aix sponsa*) the "fall ducks and broad bills" as they are plentiful on larger waters in October and November, as also the "golden eye," some of which remain all the winter in the open parts of the river St. Lawrence. Of other birds in this district I will mention some of the rarer kinds, which I have noticed myself or heard of during the last three years. The bald eagle nests every year in the township of Lansdowne, near the river St. Lawrence, also near Marble Rock in Leeds. The osprey is a very rare bird and does not appear to nest. I have seen only one. Of hawks, the red-tail passes to and fro in spring and fall, and if it breeds here rarely does so ; the red-shouldered (*Buteo lineatus*) is the commonest of the large hawks and breeds abundantly : I have seen one specimen of the broad winged hawk (*Buteo Pennsylvanicus*) in May last, so it possibly breeds. The other hawks are the sharp-shinned and sparrow, the latter quite common. I should not forget to mention the marsh hawk, which is not uncommon and breeds in the marshes. The eggs of a set I saw in 1890, five in number, were boldly marked and spotted. Of owls we have a great variety, but none are common, the snowy owl and the great cinereous owl have both been captured in winter near the Blue Mountain, and I have seen specimens, as well as the Virginian horned owl, which is generally distributed but not common. Of the long eared-owl, I saw a specimen shot within a distance of ten miles, in November 1890. The short-eared owl, two specimens procured in the township of Lansdowne in 1890; the screech owl, (*Megascops asio*) caught at Lansdowne in October 1891, which I now have alive; and the barred owl, and saw-whet; a specimen of the latter was caught alive at the river St. Lawrence in June 1890. All these varieties I have seen. Of other birds the white-rumped shrike is common, the northern shrike (*Lanius borealis*) appears every winter. The towhee (*Pipilo erythrophthalmus*) is a common bird, hatches in June. I found the nest with four eggs, May 19, '91. I noticed a pair of morning doves, (*Zenaidura macroura*) in April 1891, in the township of Lansdowne. The flycatchers are common. I noticed a nest of the wood pewee, (*Contopus virens*) on a horizontal branch of a beech tree in June last, and in the same grove also on a beech tree obtained a nest of the ruby-throated hummingbird. Of warblers the rarest I have seen is the "mourning," of this I watched a nest with four eggs in June 1891. In marshy districts around Charleston Lake the long-billed marsh wren is very common, breeding in all suitable locations; the winter wren occasionally breeds, and in 1890 I found a nest in a rotten stump close to the ground, not ten yards from the tree on which the bald headed eagle nests, a striking reminder of the frequent proximity of majesty and insignificance. Of water fowl, the favourite haunts of these birds are so numerous, that it would be strange if there were not a fair variety. The bittern, the great blue heron the green heron, I think, though not quite sure, the black and wood ducks, the coot, the horned grebe, (*Colymbus auritus*) all breed in the Blue Mountain district, as too the woodcock, a nest of which species with three eggs, I saw in June 1890; the Virginia rail, nest with nine eggs June 17th 1891 and the kildeer plover. A nest of Bartram's sandpiper was found in an upland meadow in 1889 with eggs and it is probable that the solitary sandpiper also breeds, as I have seen the old birds as late as June and as early as August. Of other birds I am assured by a person who has travelled in the North West, that he saw a flock of sand hill cranes pass over the township of Escott in 1890, and recognized the birds by their cry. In the present month December 1891, I have seen two wax wings, *(Ampelis garrulus)*. Space does not permit me to go further into an account of the birds, as I must mention some of the more striking plants. The rarest plant I have met with is the dwarf sumach, (*Rhus copallina*) found by me about a mile inland from the river St. Lawrence in October last in the township of Lansdowne. The bright red foliage of the plant at that time of year formed a noticeable feature. I understand it has only been found once before in Canada on an island in the St. Lawrence river near Brockville. I enclose a leaf. In the same locality I find the pitch pine, *Pinus rigida* to be a common tree growing in suitable places, *i.e.* rocky ground on the islands in St. Lawrence and north, on and around the Blue Mountain. The red cedar is also a common tree here, growing in this section of country invariably as far as I have observed, on and among Laurentian rocks. Time forbids me to go into any systematic mention of other plants, but I will speak of a few at haphazard, which friends at Ottawa have kindly named for me. The closed gentian, (Gentiana Andrewsii) is fairly common from the St. Lawrence northward in moist meadows. On the borders of creeks and near the river, the ground nut, (Apios tuberosa) is a common plant. Near the Blue Mountain I met last May with pretty blossoms of the fringed polygala, (Polygala paucifolia). On the Islands among rocks as too on the Blue Mountain. I have met with the enclosed fern, a southern variety I think, (*Asplenium ebeneum.*) The mandrake, (Podophyllum peltatum) is very plentiful in places on the islands, and the little plant 'Pyrola elliptica' (enclosed) grows among the rocks. The ginseng, recently so much sought after, has been frequently found in the vicinity of Charleston Lake. We have several other plants to which I might call attention as met with in this locality, but I must pass them by now, hoping on another occasion to give a more systematic list of some varieties not commonly found. I cannot but add in conclusion that some knowledge of the *'fauna'* and *'flora'* of the country districts of Ontario and where we happen to live, is to my mind both edifying and instructive. The field is wide and diversified here in Ontario, a comparatively short distance shows great variety of soil and natural features, to a certain extent even of climate. There are few who amid the pressure of daily life, when following their avocations, but can spare a day or part of a day now and again to watch the workings of God in nature, and acquaint themselves with his works. In a comparatively new country, there may be for a time but few who thus care to spend any spare hours they may happen to have; but these few will increase. I seldom meet with a kindred spirit though no doubt such are on the increase; but I feel sure that such an institution as the Ottawa Field-Naturalists' Club seems to be, is best calculated to produce a sentiment of love for nature, and a yearning for knowledge of those things which are placed within the reach of most of us.

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EXCURSION No. 1.—TO THE CASCADES OF THE GATINEAU.

The first excursion of the season was held on Saturday, June 4th, and was one of the most successful that has ever taken place under the auspices of the Club. Amongst those who availed themselves of this opportunity to visit the beautiful Gatineau Valley were several members of the Club who live at a distance, but who were in Ottawa either attending the meeting of the Royal Society of Canada or the session of Parliament.

A large and happy party of excursionists left the Union Station at 9.45 a.m. by the new Gatineau Valley Railway, and ascended that wild and important tributary of the Ottawa, which rising away in the far north beyond the head waters of the Ottawa itself, flows almost due south from its source and joins the Grand River at right angles to its course a mile below the city. Everything conspired to make the trip pleasant, the weather was simply perfect. Old Sol shed his genial warmth over the fresh spring landscape, the air was clear but there was no rain, a grateful coolness pervaded the broad and beautiful valley up which the railway winds its way. The run from Ottawa to the Cascades was delightful and refreshing. The cars were new and clean, there was no dust, and above all, there were no mosquitoes,and the railway officials were most attentive and courteous. From the time Hull and the Canadian Pacific Railway track were left behind and the party entered the valley of the Gatineau, a varied and constantly changing panorama of great beautywas unrolled before the eyes of the appreciative excursionists. The numerous curves necessary in carrying a road through a mountainous country showed to great advantage the rounded hills covered with their copious mantle of tender green. The delicate tints of the Aspen the Sugar Maple and the Beech contrasted well with the dark foliage of the evergreens, Pines, Firs and Spruces; which again was varied by the differing shades of other trees and plants, and with the foaming torrent rushing below made a landscape of marvellous magnificence and beauty. Leaving Hull and passing through the rich farm lands which lie amongst the hills, the road runs past Ironsides and then on to Chelsea, rising at first gradually and then quickly from terrace to terrace until at the latter place the old Laurentian Hills are entered with their characteristic scenery. The railway skirts the edge of the river and gives many a glimpse of rushing rapids, weather-stained rocks, hill-side and crag scenery. Kirk's Ferry and its foaming waters were passed. This was the original objective point of the party, but as the sky appeared to be rather overcast and as the railway company had put a special train at the disposal of the Club, it was deemed wiser to run on as far as the Cascades, and at the end of the day everyone was much pleased that this change had been made. The Cascades, about fifteen miles from Ottawa, was reached at half-past ten, when Mr. Frank T. Shutt, M.A.,F.I.C.,F.C.S., Acting President of the Club in the absence of Dr. George Dawson, C.M.G., F.R.S., &c., (who is now in England as arbitrator and adviser with the Imperial authorities on the Behring Sea matter) having formally welcomed all present in the name of the Club, announced the programme. The following gentlemen acted as leaders for the day in the various branches of study:

Geology—Dr. H. M. Ami, Dr. R. W. Ells, Prof. Bailey (Fredericton, N.B.).

Botany—Mr. R. B. Whyte, Prof. Macoun, Mr. W. Scott.

Entomology—Rev. Dr. Bethune (Port Hope, Ont.).

The party then broke up into small bands and went off with the leaders to seek for treasures in this new field of work. Everyone found something of interest, and many of the visitors who had only come on the excursion for the day's outing, saw for the first time some of the charms in the study of the glorious creation around us, which make naturalists, as a class, the happiest and most contented of mortals.

At 13 o'clock (1 p.m. old fogy time) there was a general rally at the rendezvous when the inner man was refreshed. After luncheon the botanists and geologists united their forces and a visit was paid to the mica mine. The way was rough and hard but the reward was declared to be ample by all who took the trouble to climb to the pits. There were several of these, and mica was seen strewn around in large quantities, besides many other minerals of interest. Apatite, pyrites, pyrrhotile, pink calcite, pyroxene in crystals, as well as gneisses and other rocks.

At 17.30 Mr. Shutt summoned the party to the railway station and announced that the leaders would deliver short addresses upon the results of their day's work. He congratulated those present on the success of the excursion, and in a few well chosen and happy words introduced each speaker. Dr. Henry M. Ami was first called upon. He spoke in his usual pleasant and earnest manner on the minerals and geological specimens he had collected, which he exhibited, and also on the points of interest in the past history of the locality. He drew attention to the origin, nature, composition and use of the minerals met with and gave a sketch of the geological formations between Ottawa and the Cascades.

Dr. Bailey, Professor of Geology in New Brunswick University, Fredericton, N. B., followed Dr. Ami, and in a pleasant manner expressed his gratification at being present. He had been a member of the Ottawa Field-Naturalists' Club for many years, and was proud of belonging to it, as he was satisfied it was the most active and live society of the kind on this continent. He then gave some graphic notes on the theories regarding the rocks which were seen during the day.

On behalf of the entomological branch, the Acting President invited the Rev. Dr. Bethune, the well-known and talented editor of the "Canadian Entomologist," to speak. He also expressed his great pleasure at being present and meeting his fellow-members of a club which he had joined some years ago because he knew that it had good workers in its ranks, and was therefore doing good useful work in all branches of natural history. The present day, although very pleasant, had not been bright and sunny enough to tempt a large number of insects from their hiding places. Dr. Bethune spoke in a charming manner of such insects as he had captured, and all present were interested in his explanations of their life-histories.

Mr. Robert B. Whyte was then called upon to speak on the plants collected. As one of the oldest members of the club, as well as one of our best and most enthusiastic botanists, Mr. Whyte is always eagerly listened to, and all were much disappointed when his interesting account of the many treasures he had gathered, was summarily cut short by the appearance of the train and the conductor's word of command "All aboard.' The success of the day was attested by the frequently expressed wish that the day had been longer, and the Excursion Committee has been requested to arrange another excursion by the Gatineau Valley Railroad as soon as practicable.

The city was reached at 19.30, the advertised time, and the party was met at the station by a string of electric cars, which in a few minutes took all to their respective parts of the city.

All present expressed themselves as delighted with the day's outing, and a vote of thanks was passed to the railway authorities, and especially to Mr. J. T. Prince for the facilities and attention given to the members of the Club.

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SUB-EXCURSIONS.

SUB-EXCURSION NO. 1—TO ROCKCLIFFE.

The club began its field work this season on May 14, when a party of about forty members and their friends took the electric cars to New Edinburgh and examined the woods lying round Hemlock Lake. Leading the Geological branch were Dr. H. M. Ami and the Hon. Pascal Poirier. Mr. R. B. Whyte lead the Botanists, and Mr. Kingston the Ornithologists.

The weather was exquisite and the woods, although the buds of the trees had not yet expanded, were ablaze with lovely spring flowers. The wistful Hepaticas peeped out from behind rocky points on Rockcliffe, and the modest Spring Beauty brightened the deeper shades of the groves. The Adder's-tongue Lily and Trilliums, red and white, held their heads erect in the welcome sun-light. Violets coy and the too-retiring Wood Daffodil or Bell-flower, together with the Wood Mignonette (*Tiarella*) and stalwart Blue Cohosh, as well as many other woodland beauties, all opened wide their blossoms to welcome their admirers. The soft downy twin leaves of the Wild Ginger with their single handsome purplish flower, were found by those who sought vigilantly for this attractive plant, and *Daphne Mezcreum*, which has become established in the woods, probably from seeds dropped by birds, added a peculiar charm to the shrubbery with its bright pink blossoms. The beauties of all these were pointed out by Mr. Whyte, and their structure and classification explained.

Mr. Kingston spoke of the birds seen or heard, and announced to his audience the arrival of the latest summer visitors.

Dr. Ami spoke on the rocks and fossils collected, pointing out their age and also the nature and origin of Hemlock Lake and the surrounding district.

SUB-EXCURSION NO. 2.—TO THE BEAVER MEADOW, HULL.

A small party of about a dozen members visited the Beaver Meadow, Hull, under the leadership of Dr. Ami and Mr. T. J. MacLaughlin, on 21st May. Amongst the plants collected *Orchis spectabilis* and *Camptosorus rhizophyllus*, the Walking Fern, were the most interesting. Although the day was propitious, not many insects of rarity were secured.

OTTAWA FIELD-NATURALISTS' CLUB

TREASURER'S BALANCE SHEET, 1891-92

RECEIPTS

1891.				
March 18	—To balance from previous Club year		$ 15 12	
1892.				
March 18	—To Subscriptions :			
	Arrears of previous years	$ 36 00		
	Current year 1891-92	163 00		
	Paid in advance for 1892-93	6 00		
			205 00	
	" Advertisements		41 00	
	" " Naturalists " sold		9 35	
	" Received for Authors' " Extras "		27 65	
	" Net proceeds Excursion to Kingsmere 30 May '91		11 55	
				309 67

EXPENDITURE

1892.				
March 15	—By Ottawa Naturalist, Vol V.,	$225 97		
	" Postage on same	10 75		
			236 72	
	" General postage		7 38	
	" " printing and stationery		4 60	
	" Cost of Authors' " Extras "		25 05	
	" Gratuity to Janitor Normal School		5 00	
	" Expenses of Soirees		2 20	
	" Balance on hand		28 72	
				309 67

Audited and found correct
Ottawa East. April 4th, 1892.

A. G. KINGSTON,
Treasurer.

J. BALLANTYNE,
WM. A. D. LEES,
Auditors.

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EXCURSION NOTICE.

An excursion will take place on Saturday afternoon, July 9th, to Casselman by the Canada Atlantic Railway. This is a most interesting locality, and very satisfactory rates have been received from the railway company. The excursion will leave the Elgin St. station by the 2.15 train, and the party will reach Ottawa again at 8 30 p.m. Tickets may be obtained from any member of the Council before leaving, or upon the train, at the following rates :

Members of the Club	40 cents.
Children under 12	20 "
Non-members	50 "
Children under 12	25 "

SOME OF THE PROPERTIES OF WATER.

By Adolph Lehmann, B.S.A.

(*Delivered March 10th, 1892.*)

In addition to being one of the most widely distributed substances known to us, Water is one of the most valuable compounds. Without it life from the highest to the lowest forms would be impossible. Owing to its solvent action it is the carrier of plant life in the soil. It enables transformation and translocation of materials in the tissues of all living bodies, enabling them to grow. It plays a part in the electric currents of the atmosphere, and acts as a most powerful equalizer of the climate of our globe. It is one of the principal factors in the formation of soils; and has at the same time assisted in the production of many of the rock formations. It is a purifier of the atmosphere. In short it may be considered as a balance-wheel of nature.

Having such useful and varied functions to perform, it would doubtless be interesting to study its properties, even if they were the most simple; how much more so is this the case when they are, as we find them, very varied and manifold, giving ample room for study and thought.

Water exists in different forms and locations. In addition to the vast expanse of oceans, lakes and rivers in the Torrid and Temperate Zones, and the plains of ice and snow to the north and south of these, it is present in varying percentages in nearly all organic substances. It can be detected in apparently perfectly dry paper or wood. Hay, straw, and the various grains contain in the neighborhood of 10 per cent. We find it also in some perfectly dry crystals, which without this "water of crystallization," as it is called, would fall into powder. It may be interesting to note that while milk (a liquid) contains about 87 per cent. of water, cucumbers and melons (solids) are made up of 95 per cent. of this compound. The difference is that in the former the solids are largely held in solution, while in the latter they form tissues to enclose the water—as it were a mass of minute sacks, called cells, filled with water. Since it is incompressible it helps to prevent cells from collapsing which, having thin walls, they would otherwise be liable to do. The water in succulent fruits or other parts of the plant therefore makes them firmer rather than otherwise, as is clearly demonstrated when a portion of the water is removed as in fading.

In addition to snow, ice, and ordinary water, an invisible form exists in nature as vapour suspended in the atmosphere, or as steam enclosed in the boilers of our engines.

These three forms of aggregation—solid, liquid and gaseous—have of course the same composition; but, as we know, vary in appearance and properties. They are easily transformed one into the other, and frequently exist in nature in contact with each other. Although easily accomplished this transformation is not so simple as, without reflection, we might suppose. If a thermometer be placed in contact with melting ice, it will always indicate the same temperature no matter what the heat applied to the ice may be, and furthermore, so long as any of it remains in contact with the resultant water, this also does not vary, but remains constantly at the freezing point. Since neither the ice nor the water have increased in temperature the heat applied to them is not indicated by the thermometer, and is hence called *latent heat.* Heat, as we know, can be transformed into force, and in this case it has it has been used to overcome the force which holds the minute particles (called molecules) of which the ice is composed, in their place, preventing them from moving past each other as they do in liquids. The heat necessary to do this work can be measured by applying a definite amount (in the shape of hot water) to a pound of ice. If we were to mix a volume of water at 80°C. (176°F.) with the same weight of ice at its melting point, and could prevent the loss of any heat, we should find that after a time the ice would have disappeared, and two volumes of water at the freezing point would be the result; clearly showing that considerable heat had been rendered latent.

Very frequent use is made of this property of water, as for example in "freezing mixtures." In these the heat required to melt the ice is supplied by the materials to be cooled or frozen. A convenient form is that in which this material (i.e., a can of cream) is imbedded in a mixture of salt and ice. Since salt is very soluble it can cause the ice to melt at a much lower point than it generally does, thereby materially reducing it in temperature. In the construction of the scale for his thermometer Farenheit used the lowest point obtainable by this mixture as the beginning, while both the other makers used the freezing point as their zero.

In the transformation of water into steam a very much greater amount of heat is consumed (about 6½ times as much) than by melting ice. This is illustrated to some extent by the comparatively long time required to vaporize water after it has reached the boiling point. Since the steam generated has the same temperature as the water from which it has been formed, the length of time required to vaporize the latter compared with that necessary to bring it to the ebullition point indicates to some extent the heat rendered latent. If this latent heat in steam did not exist we should be unable to use boiling water, as at present, for the preparation of our food; for as soon as it had reached this point it would immediately vaporize to be almost instantly deposited again as water on the somewhat cooler materials with which it would come in contact.

Although the boiling point like the freezing point serves as a standard in the manufacture of thermometers, it is not constant under all circumstances. On the top of mountains it is much lower than at the sea level; in fact so material is this variation that comparatively small differences in altitude can be determined by it. Thus it may be made to partially serve the purpose of a barometer; for, like the height of the mercuric column in that instrument, its height is dependent upon the weight of the atmosphere. That by an increased pressure this point is also increased is often seen in the boilers of steam engines; and that low pressures have the opposite effect is strikingly illustrated by numerous simple experiments. If, for example, a flask containing some water be heated till it is entirely filled by steam and the residual water, and then tightly corked, the water in it can be made to boil by cooling the flask. The steam being condensed the pressure would be reduced and the vapour developed finding less resistance could pass through the water to the surface and cause what is known as boiling. Water contained in a tube enclosing a partial vacuum can reach this stage when heated by the hand.

The temperature at which water, or rather watery solutions, disengage steam, is, in addition to pressure, considerably influenced by the nature and quantity of the materials dissolved. Many gasses reduce and solids increase it. A saturated solution of salt boils at 102°C., and one of calcium chloride at 179°C.

Several other factors have been noticed to influence the boiling point, e.g., the quantity of water used and the material composing the vessel in which it is heated. Single drops of water suspended in other liquids have been heated many degrees above this point before they suddenly transformed into a volume of steam. In a perfectly clean glass vessel, water has been heated to 106°C. before ebullition commenced. Together with the first bubble, however, sufficient steam was generated to reduce the temperature to the normal boiling point. This cause of "bumping" may be overcome by placing a piece of metal in the bottom of the flask.

The value of water as an extinguisher of fire is partially dependent upon the large amount of of heat absorbed when transformed to steam and partially upon the fact that it serves to prevent the oxygen of the atmosphere from coming as readily in contact with the burning material. Combustion of such substances as wood and coal is dependent on their union with oxygen, and this does not take place to such an extent as to cause what is known as burning, unless they are heated to a considerable degree.

Although taking place more quickly when boiling, we know that water can evaporate at any temperature between the boiling and the freezing points, in fact considerably below the latter. Ice will evaporate on a cold winter day as clearly shown by clothes drying at such a time. We might therefore be almost justified in saying that we could boil ice. This term is, however, only applied to liquids, and only when the vapour is formed throughout the mass and rises as bubbles to the surface. When this is not the case we speak of liquids as evaporating and solids as volatilizing. The singing noise sometimes heard in water shortly before it reaches the boiling point is produced by the formation and subsequent collapsing of bubbles of steam.

As in melting ice, the heat rendered latent in vaporization is expended in changing the relation of the molecules to each other. These are much further apart in steam than in water. One volume of the latter would occupy nearly 1700 volumes when converted into the former by boiling, at the ordinary pressure of one atmosphere. If, however, half this weight be removed the steam would occupy double the space. Therefore we say that steam is elastic. But it is not so to an unlimited extent; for if, instead of diminishing, we were to increase the pressure a large portion of the steam would be converted into water. That is to say, the tension of steam at 100°C. or its power to withstand pressure, is equal to one atmosphere (the weight of a column of air from the sea-level to the limit of the atmosphere, equivalent to the weight of a column of mercury of the same diameter 760 mm. high). Steam heated to a higher temperature (as can be done in the boilers of steam engines) can resist a greater force before being converted into water. It is, therefore, able to do some work in addition to resisting the atmosphere. If cooler than 100°C. its tension is less than that necessary to resist the atmosphere; and, therefore, being unable to entirely resist it, the steam must be mixed with the air (in proportion depending on the temperature) if it is to remain uncondensed. The cooler it is, the greater the proportion of air mixed with it must be; or, since the temperature of the steam and the air are the same, we may say the cooler the air the less aqueous vapour it is able to hold.

When air is completely saturated with vapour, it is said to be at its *dew point.* If subsequently cooled, a portion of the vapour will separate; if heated, it can absorb still more. This we find frequently illustrated in nature. A glass of cold water brought into a warm room frequently condenses a film of water on its surface. During cold weather dew is often deposited from the atmosphere of the warmer room on the windows. Clouds and fogs, which consist of minute drops of water too small to fall to the ground, are produced by a warm current of air laden with moisture coming in contact with a colder one, lowering its temperature below the dew point. That the clouds surrounding the peaks of mountains appear to remain there permanently, notwithstanding that a slight wind may be blowing, is due to the cold atmosphere produced by the ice, snow, or glaciers being confined to narrow limits. The warm air striking these produces a cloud which disappears when the warmer region is again reached; for the drops of water being once more evaporated become invisible like aqueous vapour always is.

The minute drops of water in the clouds, if gathered together into larger ones, replace, by the formation of rain, hail or snow, the evaporation continually taking place at the earth's surface. At the same time it removes some of the moisture from the atmosphere. Thus the variations in temperature, in addition to supplying us with rain and the beneficial results following it, viz., the purifying of the atmosphere from dust and various gasses, returning to the soil the fertilizing materials expended in the atmosphere, and feeding the springs and rivers, and furnishing the higher lying districts with water; they also serve to prevent the air from being at all times at its dew point.

As has been mentioned water has a great power to act as an equalizer of climate. By its evaporation during the day it has a powerfully cooling influence. This is easily observed when comparing the refreshing coolness of a lawn, which is largely due to the moisture evaporated by the grass, with bare streets and sandy plains. In addition to this cooling influence, which is the greater the warmer the day, vapour has a tendency to preserve the heat during the night, as it acts as a mantle or blanket to the earth, preventing the too rapid radiation of the heat absorbed during the day. The rapidity with which the thermometer drops during a clear star-light night, when the vapour has been partially deposited as snow or rain or drifted by the winds to other parts of the globe, is frequently observed when compared with what takes place on cloudy nights.

But the water, as such, acts also as an equalizer of temperature. We find that some materials do not increase in temperature as rapidly as others when exposed to the same source of heat; i.e., some do not vary as easily as others, notwithstanding that they may absorb the same quantity of heat. This is easily seen when comparing the rapidity of increase in temperature of dry sand with that which has been previously moistened; or water with iron or some other metal when exposed to the heat of the sun. The metal and the dry sand become warm much more quickly than the wet sand or the water. Yet, making allowance for the evaporation of water and the quantity of heat reflected from them, the water, though very much colder, will have absorbed the same quantity of heat as the other materials and can again transmit it to cooler bodies. Thus during the day, more especially during the summer months, it absorbs the heat of the sun and liberates it again at night, or during the colder part of the year, at the same time remaining itself comparatively uniform in temperature. Even a small lake frequently protects plants growing on its shores from injury, while those at some distance may be killed by an early autumn frost. The larger the body of water the more marked its equalizing influence will be, and the greater the extent of country benefited by it.

Generally bodies expand with heat and contract with cold. Water is no exception to this rule at the higher temperatures, but when below 4°C. it acts exactly opposite to this law. At this point, therefore, it has its maximum density, i.e., is heavier than at any other temperature. by this property water is still further preserved from variation, for the heaviest portion (that nearest 4°C.) will remain at the bottom where it is protected by the layers overlying it.

A popular impression is that, owing to this peculiarity of water rivers and lakes are prevented from being frozen solid to the bottom in winter. Although, in addition to the high specific heat of water, it doubtless helps to prevent this, the principal cause is to be sought for in the properties of ice. During its formation it expands very considerably and, therefore, occupying more space than the water is lighter than it and floats on the surface. Being a bad conductor of heat it serves as a mantle, retarding very materially the action of the cold atmosphere on the water. That ice occupies more space than water is shown by the fact that when water is allowed to freeze in pipes or other vessels they are very frequently broken by it. The heaving of fence posts and, to some extent, the bad roads in spring are also indications of this property. Although doubtless sometimes doing considerable injury this expansion of water when solidifying has been of immense value in the formation of soils.

Ice follows the general law of expanding with heat and contracting with cold. The rolling, thundering noise sometimes heard on large planes of ice, when the temperature is falling is caused by the contraction and subsequent cracking of ice. The fissures being filled with new ice, the plane, on the advent of warmer weather, expands increasing in area. The force with which this takes place is very considerable, as frequently large stones are moved and heavy timbers broken by it.

As the melting point of ice is always the same under ordinary conditions, so the freezing point remains constant under similar conditions. But if water be subjected to pressure or kept entirely undisturbed it can be cooled considerably below the temperature at which it generally solidifies. A like result is said to follow if it be exposed in fine capillary tubes. As soon as the pressure is removed or the water disturbed, ice forms very rapidly, the water at the same time increasing in temperature till the point at which it generally freezes is reached. The heat then manifested, by an increase of temperature was up to that time latent in the water. A very interesting experiment to show that pressure affects the freezing of water was made by filling a cannon ball (shell) with water, closing the opening and exposing it to a low temperature. After a time the pressure produced by the formation of ice was sufficient to break the ball. The pressure being relieved the water froze so quickly that the portion of it which had been forced out had not time to drop to the ground but formed a well defined, sharp ridge of ice.

A factor influencing the freezing of watery solutions is the nature and quantity of the material dissolved. If these be gaseous the water will generally freeze more readily, therefore, water which has boiled requires a lower temperature than that from which some of the gases have not been driven off by boiling. On the other hand solids held in solution lower the freezing point. Since the sap of plants consists of a watery solution of principally solid materials separated by the cell walls into narrow channels or small drops—both factors retarding freezing—we may look in this direction for the explanation of the fact that some herbaceous plants can withstand several degrees of frost without injury.

Remembering that water is only a simple inorganic compound, and reflecting upon its many properties and varied functions, not only in nature but also in the arts, how it is made use of in the steam engine, the hydraulic press, and the water wheel; in the laundry and the kitchen—its effects in the lakes and rivers—how it has excavated monstrous caves and deep ravines— its aid to commerce and its important offices in the soil and the atmosphere, in plants and in our own bodies—and then, when we notice how every property it possesses seems specially designed to make this globe more perfect and to assist in the working of the laws of nature, I am convinced that those who reflect on these things must all feel a desire to study these laws more thoroughly.

EXCURSION TO CASSELMAN.

No. 2.—1892.

The second excursion of the season took place on the 9th inst., and, as advertised in our last issue, the *rendez-vous* was Casselman.

Notwithstanding threatening skies and occasional showers, about twenty-five members and their friends assembled at the Canada Atlantic Railway Station and, nothing daunted, boarded the 2.15 p.m. train. An hour's pleasant ride brought the party to their destination, where by the courtesy of the railway officials a car was side-tracked for the accommodation of the excursionists. As it came on to rain shortly after our arrival, this kindness of the C. A. R. was much appreciated by many of the ladies who determined to make the car their headquarters.

Despite the shower and braving the mosquitoes, the rest of our party, headed by the energetic Vice-President, Mr. F. T. Shutt, struck down to the river bank. At first the walk along the valley of the winding stream was easy and pleasant and as many a picturesque vista of meandering river and forest-clad banks opened out to view it was very much enjoyed. But soon, alas, the way became more slippery, the underbrush thicker, the mosquitoes more numerous, and some of us, wet and irritated by the myriad attacks of our winged foes, succumbed—gave up further scientific pursuit and returned to the ladies and the car. Those who kept on, however, were well rewarded by the collection of a large number of plants in flower (49) and some magnificent and beautiful ferns—specimens of the *Onoclea Struthiopteris* over six feet in height being obtained.

The exploring party returned from their expedition with keen appetites and enjoyed their tea in the country thoroughly.

The Acting President, Mr. Shutt, spoke for a short time of the beauty of the locality and the pleasures always to be found in attending the Club excursions. Although the party was small, owing to the weather, he felt sure that all had spent a pleasant and instructive afternoon. He suggested that as so few were present it might be better to dispense with addresses upon many of the branches of Natural History. The locality was a rich one in all the different lines of study and on the present occasion they had with them Mr. J. F. Whiteaves and Mr. F. R. Latchford, both distinguished conchologists. He learned, however, that no species of particular interest had been secured. On a previous occasion Mr, Latchford had found here the only Ottawa specimens of *Helix dentifera*. Most of the collections of the day had been plants, and he therefore invited Mr. Whyte, the Botanical leader, to speak of some of the more interesting species.

Mr. Robert B. Whyte spoke with his usual ease of the many floral treasnres that had been observed or collected by members of the party. About fifty different plants had been found and specimens were shown of the following: Willow-leaved Meadow-sweet (*Spiræa salicifolia*), Twin-berry (*Mitchella repens*), the Loosestrifes (*Lysimachia stricta* and *L. ciliata*), the Moonseed (*Menispermum Canadense*). This last was used as an illustration of the beauty of many of our native climbing plants and their value as ornaments to our dwellings. The Evening Primrose (*Œnothera biennis*) in like manner served to introduce the subject of night-flowering plants. The three wild Raspberries (*Rubus strigosus*, *R. odoratus* and *R. Canadensis*) were used as a text for remarks concerning fruits, and their structure was compared with the Apple, the Plum, and the Strawberry, all of which belong to the same large order the *Rosaceæ*. The Gooseberries, wild and cultivated, were also treated of, as well as some of the ornamental members of the Heath family as *Kalmia angustifolia* and the Round-leaved Winter-green, (*Pyrola rotundifolia*). When speaking of the White Meadow Rue (*Thalictrum Cornuti*) the fertilization of plants received attention, and the seeds of Avens (*Geum strictum*) and the Traveller's Joy (*Clematis Virginiana*) showed the manner in which the distribution of plants was secured. When Mr. Whyte had finished his interesting discourse it was time to return home, and Ottawa was reached at 8.30 p m. Although the weather prevented many from going and those who did venture from enjoying themselves as much as they might otherwise have done, the excursion was by no means an unsuccessful one, and no regrets were heard from the returning party.

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BOOK NOTICES.

MANUAL OF INSTRUCTIONS FOR COLLECTING AND PRESERVING INSECTS, by C. V. Riley, M.A., Ph.D., United States Entomologist.

We have just received a copy of the above named work which will be gladly welcomed by a large number of students of nature. There is, perhaps, no enquiry which is more frequently made by amateur naturalists than, "Where can I get the best directions for collecting and preserving insects?"

And there is also, now, since Economic Entomology has become recognized as so important a factor in agricultural pursuits, a constant demand from farmers and gardeners for information as to the best means of collecting for study or for forwarding to specialists for identification any insects which may be found attacking their crops, or concerning which they may wish for enlightenment as to their habits. Prof. Riley has provided in this volume a most complete answer to these demands. Great skill has been shown in selecting from so vast a subject those details only which the author's great knowledge and experience enabled him to judge, were essentials.

This work, which is a pamphlet of 149 pages, excellently well printed and profusely illustrated with figures of the very first order, many of which have been prepared especially for it, is issued by the Smithsonian Institution, as Part F of Bulletin of the United States National Museum, No. 39.

A concise classification of true insects gives in a few pages an excellent summary of the science of Entomology, which is so well illustrated that any tyro will with ease recognize the order to which such specimens as he may find belong.

The different apparatus and means of collecting and killing insects are then dwelt upon at length with special directions for each order.

Under the heading Entomotaxy the preparation, labelling and care of specimens, with the necessary apparatus, cabinets and materials, are treated. Special attention is given to cabinets and their arrangement, and under Museum Pests, Mould, etc., much valuable advice is given which could be gained only by the experience of many years of constant work.

The rearing of insects from the egg is the next subject. Here we find full instructions for carrying on successfully this fascinating work.

The directions for packing and transmitting insects are short but complete, and it would be well if many that are not merely amateurs would read them carefully and carry them out.

A useful appendix to this manual is a list of text books and other entomological works, with suggestions as to the best way to obtain them.

The publication of this book must, we believe, be followed by a largely increased interest in the study of insect life, as we feel strongly that the chief reason why so few young people, both boys and girls, on this continent have not had their eyes opened to the charms of this branch of Natural History, to say nothing of its usefulness, is the want of such a help as Prof. Riley has now provided in this concise, complete, and plainly written manual.

THE ORTHOCERATIDÆ OF THE TRENTON LIMESTONE OF THE WINNIPEG BASIN, by J. F. Whiteaves, (Trans. Roy. Soc. Can., Vol. IX, Section IV., pp. 77-90, 1892.)

This paper as the author indicates "consists of a critical and systematic list of the *Orthoceratidæ* at present in the Museum of the Geological Survey of Canada from the formation and region indicated it its title, with descriptions of such species as appear to be new." The specimens were obtained, for the most part, by officers of the Geological Survey of Canada: Dr. Bell, Messrs. Tyrrell, Weston, Dowling, Lambe and also by a number of gentlemen interested, e.g., Messrs. Donald Gunn and A. McCharles, the last mentioned having sent unusually fine specimens in 1884.

In this paper Mr. Whiteaves departs from the classification of *Cephalopoda* by Karl Zittel and considers the genera *Actinoceras* and *Sactoceras* as distinct from *Orthoceras*, and *Poterioceras* from *Gomphoceras*. The characters of the specimens examined by Mr. Whiteaves and the grounds upon which that author separates these genera are in our estimation valuable and valid.

The following is a list of the species described and figured (for the most part) in this important paper:

1. Endoceras annulatum, Hall, var.
2. " subannulatum, Whitfield.
3. " crassisiphonatum, N. Sp.
4. Orthoceras Simpsoni, Billings.
5. " semiplanatum, N. Sp.
6. " Selkirkense, N. Sp.
7. " Winnipegense, N. Sp.
8. Actinoceras Richardsoni, Stokes.
9. " Bigsbyi, Bronn.
10. " Allumettense, Billings.
11. Sactoceras Canadense, N. Sp.
12. Gonioceras Lambii, N. Sp.
13. Poterioceras nobile, Whiteaves.
14. " apertum, Whiteaves.
15. " gracile, N. Sp.

It is interesting to note the wide geographical distribution of *Actinoceras Bigsbyi*, Bronn, and of *A. Allumettense*. These two species are well known in the Ottawa region, where there are many Cephalopods of considerable interest which deserve careful study and examination.

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A BOOK FOR BOYS.

We are much pleased to announce that Mr. S. H. Scudder, the well known author of an extensive work on the "Butterflies of the Northern United States and Canada," has now in preparation a Manual for Boys, upon the same subject as his great work. A most noticeable difference between boys and girls in Europe and on this continent is that, in the former nearly every child has some hobby—some pleasant and in most cases improving, but at any rate all-satisfying occupation—to keep it out of mischief. To children Nature offers great charms. There is not a single large school where some of the boys do not study Natural History. The masters, well knowing the value of these pursuits not only on account of their great use in education as preparing the mind for careful and accurate methods of thought and observation ; but also as inducing healthy exercise and out-door occupation, do everything to encourage scholars to investigate Nature. In Great Britain, in France, in Germany, there are good, cheap, illustrated works upon insects. Many an Entomologist who has afterwards risen to eminence owes his distinction to having had his attention drawn to the study of insects either by a schoolfellow or from having been presented with one of these books. We have absolutely no work upon the many beautiful Butterflies which frequent our Canadian woods, prairies and mountains. Such a volume for Canada and the Northern States as "Coleman's British Butterflies" would be an inestimable boon to many—not only the young, who would be charmed with the many treasures which they would find they had everywhere around them; but also to fathers and mothers and aunts and uncles who are so often at a loss to find suitable presents for children. Mr. Scudder's name alone is a guarantee that the work will be well done.

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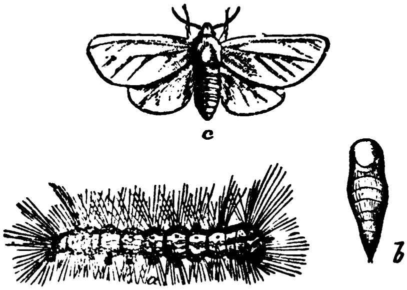
THE FALL WEB-WORM (*Hyphantria cunea.*)

By J. Fletcher.



In the above figure are shown the caterpillar, chrysalis and perfect insect of the Fall Web-Worm, one of the greatest pests to our shade and fruit trees. The moth, which in the northern form, as it occurs at Ottawa, is pure white with gray antennæ or feelers; its front thighs are yellow and the feet dark. Further to the south the moths are frequently ornamented with many black spots, but I have never seen this form in Canada. At the present time, many of our shade trees are rendered unsightly by the nests of the social caterpillars of this insect and this note is inserted to request the members of the O. F. N. C. to set a good example by destroying them whenever they observe the nests, and requesting others to do the same on every opportunity. As yet the webs are not very large, but they will be rapidly increased in size by the caterpillars as they grow to maturity, and unless removed will remain through the winter as a disfigurement to the trees and a disgrace to the community.

The eggs are laid upon the leaves of a great many different kinds of shrubs and trees in July, in clusters which are composed of a large number of greenish white eggs and are more or less hidden by a loose covering formed by the female of her own scales. The eggs soon hatch and the young caterpillars at once begin to spin a protecting web. They are pale yellow at first, with black heads and two rows of black spots along the body, and are covered with slender hairs. When small they eat only the upper surface of the leaves, skeletonizing them. They grow rapidly and enlarge the web as they develop. They remain almost entirely in their tent and will destroy the foliage of a large-sized branch in a short time. When full-grown they are about an inch in length and vary greatly in their markings. Some specimens are pale yellowish, whilst others are of a deep gray. The head is black and there is a broad dark stripe down the back. Along each side is a yellow spotted stripe. The body is covered with long soft hairs which vary in colour, and whice arise from a number of small black or orange tubercles. When almost full-grown they give up their social habits and scatter in all directions to continue their depredations. They pass the winter in the chrysalis state within slight cocoons which they spin either amongst fallen leaves, in crevices of bark, or a short distance beneath the surface of the soil, where they remain until the following summer.

The webs from the very first are conspicuous objects and from the social habits of the caterpillars a whole colony is easily destroyed by cutting off the nest and trampling it under foot. To take this small trouble in order to protect our shade trees from one of their worst enemies is what I am asking our members to do.

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A. A. A. S.

The next Annual Meeting of the American Association for the Advancement of Science and the Associated Societies, will be held this year at Rochester, N.Y., beginning on August 15th and ending about August 24th. The proximity of Rochester should induce many of our members to take this opportunity of meeting the uumerous men of note who always attend the A. A. A. S. meetings.

EXCURSION III.

TO LA PÊCHE ON THE GATINEAU.

The Third Excursion of the Club will most probably be held on Saturday, September 3rd, to LA PÊCHE, on the Gatineau Valley Railway. The great success of the first excursion up the Gatineau, added to the fact that a large number of members who have asked for another expedition by the Gatineau Valley Road, have induced the Council to arrange for another outing as soon as possible. Definite arrangements cannot yet be made as to the prices of the tickets. These will probably be about 50 cents for adults. The larger the number that attend, the smaller will be the price. There is no desire to make any profit on the Club excursions, all that is wanted is to cover the necessary expenses. An effort is always made to get as large an attendance as possible so as to popularise the Club and its objects, which are to bring together for a pleasant day in the country those interested in the various branches of Natural History, and to take every opportunity of inducing more to study the things of beauty which surround them on every side. Arrangements are always made to give members of the Club an advantage in the prices of the tickets; but the excursions are open to all without exception. The Council trusts that every member will help to make this excursion a succes and endeavour to attend and induce others to do so also. Definite notice of the prices of the tickets and of the times of the trains will be given in the September OTTAWA NATURALIST, which our readers are respectfully requested to consult. Every notice of an excursion which is made by circular costs, for printing and postage, about $4 which has to be made up by charging a higher rate for the tickets. If, therefore, members will look for NOTICES on the top outside cover of the monthly magazine they will see at a glance if there is to be an excursion, and inside on the last page will be found the full particulars. In this way the expense of the circulars will be obviated and the price of the tickets will be reduced.

ADDITIONAL NOTES ON THE GEOLOGY AND PALÆONTOLOGY OF OTTAWA AND ITS ENVIRONS.

By Henry M. Ami, M.A., D.Sc., F.G.S., &c., &c.

INTRODUCTION.

The following notes comprise a brief sketch or résumé of work done by the writer during the season of 1890 in connection with the Ottawa Field Naturalists' Club.

From my note book I find that no less than nineteen excursions and sub-excursions were held in various directions around Ottawa. Old Chelsea, Lachute, Casselman, Rockliffe, Moose Creek, Hull, Gloucester and several localities within the city limits, were visited and numerous forms of interest were gathered The variety and quantity of material still to be discovered and described which the various geological terranes about Ottawa can afford are sufficient to satisfy as well as entice the student of Geology for years to come.

NOTES.

Old Chelsea.—On the 31st of May, Butternut Grove, Chelsea, was visited by about 125 members of the Club. The geological party, amongst whom were Prof. L. W. Bailey, of the University of New Brunswick, and Mr. H. T. Martin, of Montreal, visited the magnificent outcrops of crystalline limestone at the ravine, near Old Chelsea, and brought back an interesting suite of specimens illustrating the character of the belt of Archæan rocks in that district. Specimens of apatite, asbestus, serpentine, pyroxene, wollastonite, gneiss, diabase, and numerous other rocks were obtained and described by some of the leaders on the spot.

Lachute.—On the 7th of June, a joint excursion of the Natural History Society of Montreal and of the O. F. N. C. was held in the picturesquely situated town of Lachute, Que., where the geological section was put in charge of Mr. McOuat, B.A., and the writer. The Laurentian and Calciferous horizons were visited and a number of the characteristic fossils from the latter terrane were oberved in the collections, which, as judge in the awarding of prizes, I had an opportunity of examining. *Ophileta compacta*, Salter, (*O. complanata*, Vanuxem), *Pleurotomaria Canadensis*, Billings, *Murchisonia Anna*, Billings, and fragments of other forms were noted.

Mr. Whiteaves, of our Club, gave a graphic description of the geological structure of Lachute and its vicinity, whilst the writer was called upon to read the results of the competition in geology.

Casselman.—On the 21st of June over 100 members and friends of the Club visited Casselman, a favourite locality for all branches of our Club's work, along the line of the Canada Atlantic Railway, and a considerable amount of work was done in the *Trenton* and *Quarternary* deposits there exhibited. Quite a list of Trenton fossils was obtained and specimens of pottery and an arrow-head together with bones of the beaver and other creatures were found close to where on previous occasions numerous collections of Indian relics had been made. The old aboriginal fire-place, in which debris of pottery, bones, charcoal, and Indian remains were found, had been washed away by the high water and spring floods. This locality is a most interesting one, and careful research may reveal unexpected treasures in Ethnological studies.

Hog's Back, Rockliffe, &c.—The Chazy terrane which offers such an interesting field for research about Ottawa, was visited, at Hog's Back, in Nepean, and at Rockliffe, below Governor-General's Bay. Interesting rocks and trails of marine animals, some of which are perfectly new to science, and others resemble the *Protichnites* of Sir Richard Owen described in the Quarterly Journal of the Geological Society, London, from the Potsdam of Canada, were obtained and preliminary studies of them have been made.

The Trenton rocks of Governor General's Bay, Moose Creek, and the Beaver Meadow were also visited at sub-excursions and notes taken at each of these localities as to the character of the rocks, dip of the strata and fossil remains contained therein.

Gloucester.—The Utica terrane in the vicinity of the Rideau River rapids opposite the Rifle Range in Gloucester was again visited. I was fortunate enough in finding two more examples of the *Turrilepas Canadensis*, recently described by Dr. Woodward in the Geological Magazine, and it is expected that these additional representatives of that antique style of barnacle will through some light on the type specimen found at the same locality in 1888.

The Tethæoid sponge from the Utica which I had found in the excavations on Albert street in 1888 and in rocks of the same horizon on the Montreal Road about 200 yards east of the St. L & O. Ry. crossing and noted in the last Report of the Geological Branch, has beensince referred to Dr. George Jennings Hinde of Croydon, Eng., the best authority on fossil sponges, and he has described it in the "Geological Magazine" for January 1891, pp. 22 to 24. under the name of *Stephanella sancta*, (N. gen. et n. sp.)

This species along with *Brachiospongia digitata*, Owen, *Astylospongia parvula*, Billings, *Steliella Billingsi*, Hinde, *Steliella crassa*, Hinde, and *Hyalostelia* sp. from the Trenton of Ottawa, comprise most of the ancient sponge fauna occurring in the Ordovician Seas known from this region.

Moose Creek.—The Pleistocene deposits of Moose Creek, Green's Creek, Experimental Farm and Casselman were examined in several cases in detail and interesting notes obtained ;—

At Moose Creek the following species were obtained in the stratified gravels north of the C. A. R. track : —

1. Tamias striatus, Linn.
2. Mytilus edulis, Linn.
3. Macoma fragilis, Fabricius,
4. Macoma calcarea, Chemnitz.
5. Saxicava rugosa Linn.
6, Balanus crenatus, Bruguiere.

Mr. Walter S. Odell, one of the recent and valuable additions to the membership of our Club, brought to my notice several specimens of fossils from the '*Leda*' clays of Odell's brick yard, just S.E. of Ottawa city, and amongst the forms examined there were bones of the seal, and fine specimens of a fossil sponge, besides foraminifera.

LIST OF FOSSILS FROM THE CLAYS OF ODELL'S BRICKYARD

1. Phoca Groenlandica, Mueller.
2. Tethæa Logani, Dawson.
3. Saxicava rugosa, Linnæus.
4. Polystunella crispa.
5. Dentalina sp.
6. Eschara elegantula, d'Orbigny.

Besides the above notes on specimens and excursions, as well as localities visited, Montebello and Kirk's Ferry, on the North shore of the Ottawa, were visited, and interesting collections and notes taken at both places.

Montebello.—At Montebello on the 19th July, and through the kindness of Mr. L. J. Papineau, who placed his yacht and services at the disposal of the Geological Branch, an interesting exposure of the Potsdam terrane, showing rippled-marks in abundance, besides the tracks and trails of marine animals (*Protichnites septemnotatus*, Owen), was visited on the Presqu'ile north of Squirrel Island. This exposure of the Potsdam presents a bold bluff of from ten to twenty-five feet front in height, above low-water mark at this time of the year, facing the north or Laurentide Hills, clearly indicating the existence of an open and free channel from east to west in Pre-glacial times. The sandstones were beautifully glaciated in several places, and showed that the march of the old glaciers was at right angles to the present flow of the Ottawa, and in a north and south direction, down from the adjoining slope to the north.

Kirk's Ferry.—At Kirk's Ferry, up the Gatineau River eleven miles, a most successful excursion was held, and the magnificent rock cuts along the Gatineau Valley Railway afforded excellent opportunity of examining the relations of Archæan rocks of various kinds, in close contact and at times fused one into the other. Crystalline limestones, graphite, ophite, calcite, diorites and pyroxenites, as well as apatite and mica, were collected. This region and cutting is well worthy of close attention on the part of the petrographical geologist.

RADIOLARIANS.

In May, 1890, I prepared a number of specimens of rock from the Shales of the Utica, in Gloucester, from the limestones of the Trenton, Ottawa, and also from the calcareo-arenaceous shales of the Chazy of Nepean, for Mr. Tyrrell, who was sending away to Dr. Rust, in Germany, specimens of radiolarian rocks from Manitoba and the North-West. Mr. Tyrrell has since heard that the Ottawa specimens have been examined, but no radiolarians were found therein.

Although this note is negative, still it shows that probably these low organisms in the economy of nature were absent in the Ordovician seas of the Ottawa Palæozoic Basin.

CRINOIDS.

Mr. John Stewart, of our Club, whose collections of crinoids and blastoids from the Trenton of Ottawa have recently been purchased by the Geological Survey Department and placed on exhibition in the Museum, informs me that he has cleaned and prepared *twenty-five* more specimens to show the cup, arms and pinnules. The great care, industry and skill which Mr. Stewart has displayed in developing these "stars" and "lilies" of the old abyssal depths in our district are worthy of much commendation and eulogy.

OSTRACODA.

Amongst the new forms of ostracoda recently described by Prof. Rupert Jones, F.R.S, we find the following species from Aylmer and Ottawa. These forms were collected by Messrs. W. R. Billings, T. W E. Sowter and the writer, of our Club.

1. Primitia Logani, Jones, Aylmer, Que.
2. Beyrichia clavigera, Jones, " Que.
3. " var. clavifracta, Jones, " Que.
4. Isochilina Ottawa, Jones, var. intermedia, Jones, Ottawa; Ont.
5. " labellosa, Jones, Aylmer, Que.
6. Leperditia Balthica (Hisinger), var. primæva, Jones, Carleton Co.
7. " sp. (cf. L. Hisingeri), Aylmer, Que.

Of the above, only Primitia Logani, Jones, is referred to the Trenton terrane, the others and this form are all Chazy species.

In the "Journal of the Cincinnati Society of Natural History," Prof. E. O. Ulrich, well known to several members of our Club, has described the new species of Ostracod from Ottawa and also a variety of the same species from the same block of impure limestone. The specimen sent contained abundance of individuals of an Isochilina, besides a Cyrtodonta or allied genus of lamellibranchiate mollusks—all from the Chazy.

Prof. Ulrich, on pp. 44 and 45 of his paper on "*New and Little Known American Palæozoic Ostracoda,*" and on Plate XI., figs. 12a, 12b, 12c and 13, has described the following forms and named them after one of our Club:—

1. Isochilina Amiana, Ulrich.
2. Isochilina Amiana, var. insignis, Ulrich.

Both forms occur together and were collected on Sussex Street, Ottawa, from a block of erratic limestone of Chazy age, showing marks of glacial action, having come from the "till," or "boulder clay" of the vicinity.

It is the purpose of the writer to present to the Club through the pages of the NATURALIST a suite of articles on some of the best fossiliferous localities in Ottawa and Hull for the use of collectors and students in Geology.

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BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, EDINBURGH, SCOTLAND.

The 61st meeting of the British Association for the Advancement of Science was held, in Edinburgh, Scotland, under the presidency of Sir Archibald Geikie, F. R. S. etc. Director of the Geological Survey of the United Kingdom, Aug. 3rd, 1892.

This year is the *one hundredth* anniversary of the publication of Hutton's "Theory of the Earth" which is admitted to be the first plausible and rational view presented of the upbuilding and construction of the Earth's crust. It sought to account for such diversity of phenomena, formations and strata as were visible on the Earth's surface at the present day, in the changes which are now taking place. By applying this rule *in retrospectu* Hutton was able to account for the different formations now visible.

Sir. Archibald then went on to describe the various points of indebtedness which modern geologists still owe to Hutton and the Huttonian School; the "high antiquity of the Earth," the explanation of olden time phenomena by present ones, the progression in organic types, &c., &c., which with views held by Sir James Hall, William Smith, Kelvin, Playfair and others, placed the main results and leading objects in view on a scientific and practical basis.

Many opposing forces had to be met. Preconceived notions, theories and so-called orthodox views of learned men of the days of Hutton, all assailed the new theory. But it was founded on facts and hard facts which told a tale of paramount importance and exciting interest, revealing in each formation of the Earth's crust pages of unwritten history: it was the Earth telling its own tale.

Sir Archibald Geikie then pointed out the salient conclusions which had been already arrived at, with reference to the boundless antiquity of the globe, presented Lord Kelvin's views as to the limit of time that may be assigned to our planet's antiquity. " He estimated that the surface of the globe could not have consolidated less than 20 millions of years ago, for the rate of increase of temperature inwards would in that case have been higher than it actually is; nor more than 400 millions of years ago, for then there would have been no sensible increase at all." " One hundred millions of years " was regarded by him as the probable amount of time which embraces the Geological history of the globe."

These calculations, Sir Archibald holds, " may require revision," and states " that there must be some flaw in the physical argument." From his own observations on " degredation " or " denudation," the erosion of rocks and deposition of sediments, he has reached the conclusion that " the rate of deposition of new sedimentary formations over an equivalent area of sea-floor, may vary from one foot in 720 years to one foot in 6,800 years."

Then the "slow progress of organic variation " is discussed, giving its quota of evidence in support of the antiquity of the world. Precise data are wanting in this particular. " We know, says the distinguished geologist, " that within human experience a few species have become extinct, but there is no conclusive proof that a single new species has come into existence. nor are appreciable variations readily apparent in forms that live in a wild state." He then instances the seeds and plants found with Egyptian mummies being precisely the same as those of modern Egypt. This negative evidence, of no change, is an important factor in the problem, and indicates the lapse of an enormous interval of time sufficient to modify forms of shells, etc.

With reference to this problem and the Ice Age on which Sir Archibald Geikie has so ably and oftimes written, he says: " If the many thousands of years which have elapsed since the Ice Age have produced no appreciable modification of surviving plants and animals, who vast a period must have been required for that marvellous scheme of organic development which is chronicled in the rocks? After careful reflection on the subject I affirm that the geological record furnishes a mass of evidence which no arguments drawn from other departments of nature can explain away, and which, it seems to me, cannot be satisfactorily interpreted save with an allowance of time much beyond the narrow limits which recent physical speculation would concede." In conclusion the President referred to the geological features of Edinburgh, which had furnished so much material for enjoyment during his life.

H. M. A.

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BOOK NOTICE.

THE CULTIVATED NATIVE PLUMS AND CHERRIES (BULLETIN 38. CORNELL UNIVERSITY EXPT. STATION, JUNE 1892.) BY L. H. BAILEY.

In this monograph of 73 pages Prof. Bailey has embodied a large amount of practical information as well as accomplished the very difficult task of making a thorough classification of our native Plums and Cherries.

With plums the work has been particularly complicated, and only the most patient study and research could have been rewarded by such gratifying results.

Up to the present time our cultivated native varieties have been roughly assigned to three wild types. (1) *Prunus Americana*, Marshall the plum of the north and west (2) *Prunus angustifolia*, Marshall, or *P. chickasa*, Michx, native of the middle and Southern States and (3) *Prunus maritima*, Wangheim, known as the Beach plum of the south. Much confusion existed however as many of the cultivated forms could not be satisfactorily assigned to any of these original types. Prof. Bailey says, "There has been no attempt so far as I know, to make a comprehensive study of these fruits and as a consequence our knowledge of them is vague and confused. In fact, the native plums constitute probably the hardest knot in American pomology. Their botanical status is equally unsatisfactory aud the group is one of the most inextricably confused of any of equal extent in our whole flora." As a result of the author's labours we shall recognize hereafter another class, known heretofore as the Wild Goose group, under the name of *Prunus hortulana* and falling under this as a variety the Miner, a plum of considerable value to us in the north. This group is assigned an intermediate position between *P. Americana* and *P. chickasa*. To these three groups belong practically all our cultivated native varieties in Canada. The origin of the *marianna* and *myrobolan* varieties, which are now so generally used as stocks for budding and grafting, is ably discussed. By most authors. these are supposed to be of American origin, Prof. Bailey however traces them to Europe and points to a common parentage.

The Beach plum has as yet given us no cultivated varieties of any value. In this work we have the only authentic account of "an undoubted hybrid" between Troth's Early peach and the Wild Goose plum. "The leaves are long and peach like, although rather broad and short-pointed but the flower buds, although they form in profusion, never open, so the tree is barren".

The Bulletin also discusses, stocks for the propagation of and the fungous diseases of the plum. Concluding the author fitly remarks that the native plum industry has made astonishing progress and it has already assumed large proportions. It is certain to occupy a large place in future American horticulture." In discussing the natlve cultivated cherries the author is of the opinion that two or possibly three species are being grown under the name of *Prunus pumila* the sand cherry of the north and west. This is the only wild form which has gained much prominence under cultivation. In the north western States it is now being grown to a considerable extent, and under cultivation is said to be very susceptible to improvement. Other native species are discussed though their fruit does not appear at present to be of economic value.

Such Bulletins elevate the character of Experiment station research in horticultural lines, are of exceeding interest to the intelligent fruit grower and are fundamentals to a sound basis for the building of a correct nomenclature of our American Pomology.

JOHN CRAIG,
Horticulturist, Central Experimental Farm.

THE GEOLOGICAL SOCIETY OF AMERICA.

The Fourth Annual and Summer Meeting of the Geological Society of America was held last week in Rochester, N. Y., and in connection with the Forty first Meeting of the American Association for the Advancement of Science.

There were upwards of fifty fellows present. Monday and Tuesday, August 15th and 16th, were the days set apart for the reading and discussion of papers. The warmest and most animated discussion took place on the second day—when two papers on the "Ice Age," by Messrs. Warren Upham and G. Frederick Wright, well known glacialists, were taken up. Mr. Upham's paper was a detailed description of the origin, mode of formation and "conditions of accumulation of Drumlins," illustrated with numerous diagrams and figures of various forms met with in different districts. Drumlins were made up of *en-glacial* drift material accumulated rapidly and during the departure of the ice close to the border. The author referred to the irregularity of the drumlins as puzzling. The relation of drumlins to the terminal moraine was also discussed, as also the different shapes drumlins assume owing to the conditions under which they are accumulated.

Prof. G. F. Wright's paper then followed on the subject: "The extra-morainic drift of the Susquehanna Valley." This so-called "fringe" of the long, great terminal moraine was of much importance and significance. Its remote antiquity was discussed. A detailed account of careful observations made by the author in the Valley of the Susquehanna was then given. In the discussion which followed both papers Messrs. Gilbert, McGee, Salisbury, Upham, and Wright took part.

Prof. C. H. Hitchcock's "Studies of the Connecticut Valley Glacier," also proved of considerable interest.

Prof. James Hall, the veteran palæontologist of North America, who was the first to welcome us on arriving at Rochester, received a very hearty reception on presenting his paper "On the Oneonta Sandstone; its relations to the Portage, Cheming and Catskill Groups." This was a remarkable paper in which the correlation of strata by lithological or petrographical characters as well as of faunas by palæontological characters was rendered difficult by the variety and number of formations and faunas in the State of New York, characterizing the close of the Devonian epoch. The equivalencies in time and true relations of the faunas were clearly delineated, and much satisfaction with new light resulted from the observations made by Prof. Hall. Messrs. I. C. White, E. W. Claypole, J. J. Stevenson, and others took part in the discussion.

"On the dentition of Titanichthys and its allies," was the subject of an interesting paper by Prof. E. W. Claypole, giving the result of his observations on the jaws of the gigantic fish which existed in Devonian times. An important matter relating to Devonian fishes came up at this meeting of the Geological Society, regarding the mode of occurrence or origin and habitat of the Devonian fishes. Were they *freshwater* or *marine* fishes? Were they lacustrine or sea fishes. Prof. J. J. Stevenson argued for their marine character, and Prof. Claypole for their fresh-water nature. A revision of the evidence on this point is necessary before a conclusion can be arrived at.

Other papers read were as follows :—

Lawrence C. Johnson.—Notes on the Phosphate Fields of Eastern Marion and Alachua Counties, Florida.

G. F. Becker.—Finite homogeneous strain, flow and rupture of rocks.

Wm. H. Hobbs.—Phases in the metamorphism of the schists of Southern Berkshire.

Charles L. Whittle,—Some dynamic and metasomatic phenomena in a metamorphic conglomerate in tne Green Mountains.

G. C. Broadhead.—The Ozarks and the geological history of the Missouri Palaeozoic—10 minutes.

David White.—A new Tæniopterid fern and its allies—10 minutes.

A. S. Tiffany.—The overturn of the Lower Silurian Strata in Rensselaer Couuty, N.Y.—5 minutes.

Ancient Waterfalls.—7 minutes.

Of these last seven some were read by title others *in extenso* and others were briefly sketched out. Mr. David White's paper on a new Taeniopterid fern was a pleasing contribution to Palæobotany and showed those present how exceedingly careful a palaeobotanist has to be in separating portions of the same plant, parts of which at times resemble one constituted genus and at other times an altogether different one.

NOTES.

At a meeting of the Council of the Geological Society of America held on Wednesday, Aug. the 27th, it was decided to accept the invitation to visit Ottawa at the coming meeting to be held in December.

The Royal Society of Canada and the Logan Club of Ottawa made up of the scientific staff of the Geological Survey Department, had both sent an invitation to the Geological Society.

Accordingly, the Ottawa brethren of the hammer may expect a large attendance of geologists from all parts of the North American Continent in December. The Geological Society of America numbers some 250 Geologists, all of whom are actively engaged in Geological work.

Ottawa is especially favoured as a centre of geologic interest, both on account of the Geological Survey Department having its headquarters here and the Museum of economic minerals and palæontology being located at the Capital.

H. M. A.

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ENTOMOLOGY.

Edited by W. Hague Harrington.

Among the more conspicuous plants of the August landscape may be indicated Golden-rods, Mulleins, Thistles and Milk-weeds, each of which nourishes insects peculiar to itself.

The various species of *Solidago* make gay the fields and woodsides with myriads of golden plumes to which resort many insects of various orders, and especially of Hymenoptera, Here the honey bee may be found industriously working, in company with many wild relatives, as Bombus, Megachile, Andrena, Apathus. etc., while numerous kinds of fossorial wasps, etc., are generally abundant.

Occasionally on the leaves may be observed a small gourd-shaped black case, attached firmly by its neck. This is constructed by the larva of a small chrysomelid beetle, *Exema gibber*, which may be captured by beating or sweeping the flowers, but its little black wrinkled form is liable to be overlooked in the net, from its resemblance to the excrement of caterpillars. It is placed on the Ottawa list for the first time this year, several specimens having been obtained near Dow's Swamp, on Saturday, 26th August.

Phymata Wolffi, a peculiarly shaped bug, with robust raptorial fore-legs, often lies in wait among the flowers for bees and other insects. It was quite abundant at Casselman on one occasion (8th Aug.) when the Club visited that point, but none have been observed about Ottawa this season.

The Mullein is able to nourish its broad flannel leaves and tall spikes of yellow flowers in thin and stony fields, where even the thistle is starved out. It is not much attacked or frequented by insects, but a small stout weevil, or snout-beetle, *Gymnetron teter*, infests the seed-vessels. The larvæ and pupæ may generally be obtained from the nutlets, and they were especially abundant this year in mulleins growing along the gravelly beach at Aylmer. On some spikes there was hardly an uninfested nutlet.

Probably fifty per cent. of the seeds of the common Canada thistle are devoured by the maggots of a two-winged fly, *Trypeta florescentiæ*, whose presence may be detected by the irregular appearance of the down, or pappus, on plucking which it comes away without the seed and is found all matted together at the base and containing one or more yellowish maggots or pupæ, which are those of the beneficial fly.

A parasite of the fly is also very common and destroys a large proportion of the maggots. It belongs to the genus *Solenotus* of the Chalcididæ, and has been named by Hr. Ashmead *S. Fletcheri*, but its description has not yet been published.

From the infested heads are also bred numbers of another small chalcid, very similar in appearance to the Solenotus. Mr. Ashmead, who has described it in the Canadian Entomologist, considers it to be a secondary parasite.

Upon the Milkweeds at this season a very handsome greenish-black beetle with orange markings is not uncommon. It is of the same size as the Colorado potato-beetle, to which it is closely allied, and has received the name of *Doryphora clivicollis.*

A handsome black and scarlet bug, *Lygæus Kalmii*, is also abundant, but the strong odour which it emits, in common with many hemiptera, makes its capture and investigation somewhat unpleasant.

Earlier in the season there might be found upon these plants two other insects peculiar to Asclepias, viz., a longicorn beetle, *Tetraopes tetraophthalmus*, red with black spots, the larvæ of which feed in the roots or lower stems, and the larva of the big Milkweed butterfly, *Danais archippus*, a conspicuous caterpillar strikingly ornamented with narrow yellow, white and black bands.

Members sometimes enquire as to the time for collecting caterpillars, so it may be noted that just at this season the larvæ of many of our larger moths attain maturity, and thus very interesting species can be easily secured.

Among caterpillars which have been unusually abundant this summer may be mentioned that of *Leucarctia acrea*, the so-called Salt-marsh caterpillar, which, however, is not confined to the sea-coast, but has been more or less destructive all over the country.

This is also a good season to examine for galls the oaks, hickories, willows, golden-rods, Lactuca, Nabalus, sumac, asters, etc., etc.

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ORNITHOLOGY.

Edited by A. G. Kingston.

ROBINS AS DESTROYERS OF HAIRY CATERPILLARS AND WHITE GRUBS.

One of the large Wooly bear Caterpillars (*Leucarctia acræa*) has been unusually abundant at Ottawa this year, Mr. Fletcher reports having seen Robins on several occasions eating these caterpillars. They are not eaten at once; but are shaken and rubbed in the grass and on the ground for a minute or two when most of the long hairs are found to be removed. By running out suddenly the birds were on two or three occasions driven off and their victims examined. The same birds were also noticed doing good work on lawns by destroying the larvæ of the May-beetles the injurious White Grubs.

THE CHIMNEY SWIFT.

Our local colony of these singular birds, swollen by the large number of young hatched during the present season, appears to have its quarters at the Western Departmental Buildings too crowded for comfort. On the evening of 27th August a considerable flock was observed circling in their usual manner above the City Hall and finally descending into a small vertilating tower on the north side of that building. These birds have generally shown themselves intensely gregarious, and it is quite unusual for them to over-flow in this manner.

SWALLOWS.

The recent autumn-like weather with clear or cool nights and heavy dew has so shortened the supply of insect-life that most of the birds which take their food upon the wing are now showing evident signs of speedy departure. In various parts of the city large assemblies of Purple Martins have been observed wheeling for hours over some favourite district. Occasionally they may rest for a while perched in long ranks upon the Telephone wires, but each member when addressing the house rises to the wing and from the solemnity and yet earnestness of the whole proceeding it is clear that business of importance is being discussed.

When we recollect that 60 or 70 days hence must find them in Central or even South America, that this journey is to be made through all the tempestuous weather of autumn, and with a failing food-supply, and that more than one half of the company, the young of the year, are entirely without experience of long flights, it will be seen how great responsibility rests upon the leaders in these great migrations.

The last week of August generally sees the departure of these and all the other species of swallows except the White-belly (Tachycineta bicolor.) The latter the hardiest of all the family arrives a week earlier, stays at least as much later, and makes its winter home no further south than Louisiana and Mississippi.

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BOTANY.

The following Rules for Botanical Nomenclature were drawn up at the recent meeting of the A. A. A. S. at Rochester, and will, we feel sure, be read with interest by our Botanists.

THE NEW RULES FOR BOTANICAL NOMENCLATURE.

The Botanical Club of the American Association for the Advancement of Science at a meeting held Aug. 19th. 1892, adopted these principles of Nomenclature: *Resolved:* That the Paris code of 1867 be adopted except where it conflicts with the following:

1. THE LAW OF PRIORITY.—Priority of publication is to be regarded as the fundamental principle of botanical nomenclature.

2. Beginning of Botanical Nomenclature.—The botanical Nomenclature of both genera and species is to begin with the publication of the first edition of Linnæus's "Species Plantarum," in 1753.

3. Stability of Specific Names.—In the transrer of a species to a genus other than the one under which it was first published the original specific name is to be retained, unless it is identical with the generic name or with a specific name previously used in that genus.

4. Homonyms.—The publication of a generic name or a binomial invalidates the use of the same name for any subsequently published genus or species respectively.

5. Publication of Genera.—Publication of a genus consists only (1) in the distribution of a printed description of the genus named. (2) in the publication of the name of the genus and the citation of one or more previously published species as examples or types of the genus, with or without a diagnosis.

6. Publication of Species.—Publication of a species consists only (1) in the distribution of a printed description of the species named, (2) in the publishing of a binomial, with reference to a previously published species as a type.

7. Similar Generic Names.—Similar generic names are not to be rejected on account of slight differences, except in the spelling of the same word; for example *Apios* and *Apium* are to be retained, but of *Epidendrum* and *Epidendron*, *Asterocarpus* and *Astrocarpus*, the later is to be rejected.

8. Citation of Authorities.—In the case of a species which has been transferred from one genus to another the original author must always be cited in parenthesis, followed by the author of the new binomial.

John M. Coulter,
William A. Kellerman,
Lucien M. Underwood,
Lester F. Ward,

N. L. Britton,
Henry H. Rusby,
Frederick V. Coville,
Committee.

EXCURSION No. III. TO LA PÊCHE.

As noticed in the last number of the Naturalist the next Excursion has been arranged to take place on Saturday, the 3rd September. The party will leave the C. P. R. Union Station at 10 a.m. by the Gatineau Valley Railway, and will reach the city again by 7 o'clock in the evening.

Tickets, Members	50 cents.
" Non-Members	60 "
Children of Members	25 "
" Non-Members	30 "

Tickets can be obtained at the Station.

NOTES ON SIX LECTURES

DELIVERED BY ROBERT WARINGTON, F. R. S., ON THE

AGRICULTURAL INVESTIGATIONS AT ROTHAMSTED, ENGLAND.

PUBLISHED BY THE U. S. DEPARTMENT OF AGRICULTURE,
WASHINGTON, 1892.

By Frank T. Shutt, M.A., F.I.C., F.C.S.

In the early years of the present century Sir John Bennet Lawes, associated with Dr. Gilbert, began those experiments, the results of which have been so potent in revolutionizing agriculture throughout the civilized world. Thoroughly practical and at the same time thoroughly scientific, these investigations and the deductions made therefrom have served not only to materially improve the system of agriculture by increased production at decreased cost, but also to elevate farming from an art overgrown with traditions, handed down from father to son through successive generations, to the ranks of science. Agriculture has now taken its place in our universities side by side with Classics, Mathematics and Natural Sciences. It fills that place worthily ; and that this is so is largely due to the skilful and indefatigable labours of those English scientists, Sir John Lawes and Dr. Gilbert.

During the summer of 1888, the writer had great pleasure in visiting Sir John Lawes's estate at Harpenden in Hertfordshire, Dr. Gilbert very kindly acting as escort and explaining the many experiments then in progress. The grand old manor of Rothamsted, which has been in the Lawes family since 1623, was built in the fifteenth century, or as Mr. Warington remarks, before Columbus discovered America. Assisted by a young chemist of the name of Dobson, Sir (then Mr.) John Lawes began experimenting in 1837 on the effect of soluble phosphate. Although these trials were only carried on in pots, the results were so gratifying that Mr. Lawes took out a patent for manufacturing superphosphate from mineral phosphate and sulphuric acid. This marks the beginning of the manufacture of this fertilizer, an industry now grown to such gigantic proportions and of such great benefit to agriculture. In 1843 he was joined by Dr. Gilbert, a former pupil of Liebig, as chemist. For over half a century these two (Sir John himself being a chemist of no mean repute) have worked together in agricultural investigation until now their names are inseparably linked in the history of modern agriculture.

With the exception of the Experiment Station founded by the eminent chemist Boussingault in Alsace, Rothamsted was the first place at which systematic experiments in agriculture were tried. Germany followed in the good work by the establishment of a Station at Möckern in 1852. It was there that the writer saw a few years ago Respiration Experiments in progress, involving the use of costly and elaborate apparatus and a great expenditure of skilled labour of the highest order. And it may be here remarked that the results of these investigations have done much towards putting the feeding of animals on an economic and scientific basis. On this continent the first agricultural experiment station was founded in Connecticut in 1875. Sir John Lawes could therefore very properly claim priority for Rothamsted in this noble and important work, and it is here but meagre justice to state that from this early date these investigations have been conducted at his sole expense.

With the large staff of chemists constantly engaged, it is easy to imagine the vast amount of data that from time to time has accumulated at Rothamsted. The published accounts of these are to be found in the transactions of the Royal Society (England,) of the Royal Agricultural, the Chemical and other scientific societies as well as in pamphlet form and in journals devoted to agriculture. If they were now collated they would fill many large volumes. Recognizing the tremendous importance of the work and wishful that it should continue after his lifetime, Sir J. B. Lawes in 1889 endowed the institution and entrusted its management to a board of trustees. With great generosity he made over to them the new chemical laboratories recently built, the experimental fields and £100,000 as an endowment fund. In this deed of trust, known as the Lawes Agricultural Trust, Sir John made provision for a course of lectures on the Rothamsted Experiments to be delivered biennially in the United States so "that Americans may share in any benefit that may arise" from the work there, past, present and future.

Mr. Robert Warington, F.R.S., so long an associate with Dr. Gilbert in the chemical investigations at Rothamsted, was chosen to deliver the first course of lectures before the Association of American Agricultural Colleges and Experiment Stations at Washington in August of last year. The choice was a wise one. Mr. Warington being connected with Rothamsted more or less closely since 1859 was thoroughly conversant with the many lines of experiments carried on and the results obtained there. His own work there has been of a varied character. The analyses of the ash of plants and animals, the chemical examination of soils, rain. drainage and well-waters, a lengthy investigation into the process of nitrification in soils and the chemical action of certain soils and bacteria form a few of the most important subjects upon which Mr. Warington has been engaged.

It would be impossible with the space at our command to give an adequate account of all Mr Warington said at Washington. The lectures have recently been issued by the U. S. Department of Agriculture and form an octavo pamphlet of over 100 pages. They are well worthy of careful perusal by those interested in modern and progressive agriculture; it must suffice us here to do little more than indicate the subjects there expanded.

Lecture 1. Contains an historical account of the Rothamsted institution and enumerates many of the experiments conducted with animals and in the field. In this connection we must quote one experiment, as the result is both interesting and important. It proves that wheat as we know it is the outcome of artificial development and emphatically teaches the choking power of weeds. In 1882 a plot of wheat was not harvested, *i. e.* the grain was left to fall when ripe upon the ground and sow itself. "The first self-sown crop (1883) came up strong, but was so starved by the weeds that the produce of grain probably did not exceed a few pints per acre". Self-seeding was again allowed, but the end was near. "The last appearance of the wheat was in 1885." Sickly and stunted the wheat struggled for a few years against the choking weeds that grew and flourished so vigorously until its very existence became a thing of the past. Here is a lesson full of import to many a Canadian farmer.

Lecture 2. Agricultural chemists have determined that of all the elements of plant food, three may be termed essentials, since they must be continually returned to the soil in order that its fertility may be maintained. These are Nitrogen, Phosphoric acid and Potash. In this lecture Mr. Warington discusses the character of the nitrogen-holding material in the soil under three heads, 1. Ammonia; 2. Nitrates; 3. Nitrogenous organic matter. The relative and absolute amounts in which they exist and the circumstances that control their increase and decrease are given at length. He shows that while the two former are the most readily available forms for plants, it is in the organic matter of a soil that the great bulk of the nitrogen is stored up. The accumulation ot nitrogen in the surface soil takes place to a greater extent on prairie and pasture land than in arable soils; and further Mr. Warington says that "for the present we cannot, I think, affirm that soils are enriched by the free nitrogen of the air, except through the medium of a leguminous crop. A diminution of surface-soil nitrogen takes place when organic matter is in excess and air freely penetrates the soil, since the conditions are then most favourable to the growth of those organisms whose function it is to oxidise the nitrogenous organic matter. Hence, the richest soils are those most liable to waste and demand the greatest exercise of the farmer's skill to preserve their condition.

Lecture 3. Treats of a very important maker, viz. Nitrification, or the conversion of the nitrogen of the soil humus into the soluble nitrogenous food of plants. Schlösing and Müntz showed that this was due to the action of an organized ferment and Warington by experiments carried on simultaneously confirmed their conclusions. This living micro-organism has been succesfully isolated and studied by Dr. Frankland, Winogradsky and Mr. Warington. The most favourable conditions for this process of nitrification are here discussed at length. Briefly, they are the presence of phosphates, a slightly alkaline condition of the soil due to lime or other salifiable base, "a liberal supply of oxygen, the absence of strong light" and a temperature about 98° F. We here find the explanation of the fact so well known, viz., that the addition of marl or chalk (carbonate of lime) in moderate amounts to a soil and especially to one rich in humus, is of great value in increasing crop yields.

Lecture 4. NITRIFICATION AND DENITRIFICATION.—The conversion of the organic matter of a soil into nitrates is the result of the life functions of two organisms—the one a purely nitrous ferment, *i.e.*, capable only of oxidizing ammonia and nitrogenous humus to nitrites and not to the fully oxidized form of nitrates, the other, known as the nitrite ferment, whose function it is to convert nitrites into nitrates. This nitric organism completes the useful work of nitrification. By an immence amount of bacteriological study Mr. Warington at last succeeded in isolating, growing and photographing this highly interesting plant. He says, "in soil, both organisms are present in enormous numbers and the action of both organisms proceeds together as the conditions are favourable to both." *Denitrification* or the destruction of nitrates takes place in water-logged soils from which the air is necessarily excluded. This is brought about through the agency of a third living organism, and the conditions most favourable for its development are an absence of oxygen, and an abundant supply of readily oxidizable organic matter. The practical lesson from this conclusion is the necessity of well-drained land, in order that the surplus water may be carried off and the air allowed to freely permeate the soil.

The nitrates are developed in the upper layers of a soil, but being extremely soluble are washed down by heavy rains to the subsoil. Ploughed land, well drained, loses nitrates when not cropped, and more so especially in wet seasons. Bare fallow does not, therefore, entail an unmixed good. In this connection Mr. Warington says, "If a farmer could ensure dry seasons, so that the nitrates produced by a bare fallow should remain in the soil available for the succeeding crop, it would pay him better to have an alternation of wheat and bare fallow rather than to grow wheat continuously. However, in the English climate no such favourable results can be expected," as the results of 30 years' experience at Rothamsted have shown that "wheat after fallow, except in some of the earliest years, has not given the double produce which should result from the presence of a double supply of nitrates." By a system of drain gauges Mr. Warington has been able to measure this loss of nitrates. He says, "The average quantity of nitrogen as nitrate discharged from the soil during thirteen years has been for the 20-inch gauge 37.3 lbs., for the 40-inch gauge 32.6 lbs., and for the 60-inch gauge 35.6 lbs. per acre, equivalent respectively to 239, 209 and 228 lbs. of ordinary sodium nitrate. This, then, is the amount annually produced (and lost) in land left for many years unmanured, lying in its natural state of consolidation, and receiving no aëration from tillage. All vegetation that appears on these soils is removed."

Lecture 5. Deals with the "Nitrification of Soils and Manures." In it Mr. Warington points out by means of tables that the greatest loss of nitrogen as nitrates by drainage takes place during those months when the soil is not covered by a growing crop. "In June it is rare to find nitrates in this drainage water. Out of the twenty-five samples of drainage collected in June, July and August during twelve years, only three contained any nitric acid. In September, the crop being now removed, nitrates are always found in the drainage water. In a wet season the maximum amount of nitrates will occur in October. The proportion of nitrates will be maintained with little diminution during the winter months and begin to fall again in March." The crop, therefore, which has the longest growing season will be the best to conserve the nitrates in the soil. "From this point of view maize (Indian Corn) is a more economical crop than either wheat, oats or barley, its growing period extending during the whole of the summer." This lecture is brimful of practical information of a most valuable nature, and the inclination is strong to make very copious extracts, but a few more must suffice. The explanation why the cereals more especially respond to the application of soluble nitrogenous manures is given in the following words: "After a wet winter cereal crops begin to grow in a soil impoverished of its nitrates, and the growth of most cereals is over before the summer production of nitrates is half accomplished. Cereal crops are then especially benefitted by nitrogenous manures, and particularly by the application of nitrates, while for the reason already given, maize is more independent of such manuring than wheat or barley. The beneficial influence of a dry winter upon the crops of the ensuing year is now generally recognized." Mr. Warington gives scientific reasons for practicing rotation, and shows how a proper succession of crops tends to preserve and use the nitrates. This lecture proceeds to give the loss of nitrates in soils fertilized with different manures and cropped with wheat and barley. He summarizes his conclusions in the following words: "The most striking results we observe are (1) that manuring with ash constituents alone increases the production of nitrates in the soil; (2) that the bigger crops grown by ammonium salts or sodium nitrate, with ash constituents, are followed by an increased production of nitrates; (3) that the use of an organic manure like rape cake or farmyard manure is attended with a large increase in the production of nitrate, even after the first active stage of nitrification is long past.

The concluding chapter is on the "Nitrification of manures." Salts of ammonium (chloride or sulphate) are of nitrogenous fertilizers the most readily nitrified in a soil Carbonate of lime assists most markedly in this process and Mr. Warington is of the opinion that lime or other salifiable base is deficient in those soils upon which ammonium salts do not act beneficially as a fertilizer. It would appear that guano is very easily nitrified. Müntz and Girard place it in this respect next to ammonium salts; "following guano come green manures (lucerne and lupines,) which compared with other forms of manures, appeared to be especially active in clay soils; the third class includes dried blood and meat and powdered horn; far below these stand poudrette, wool and leather."

Lecture 6. Drainage and well waters. This lecture has for its subject the consideration of the chemical composition of the drainage and deep well waters at Harpenden, as well as a detailed account of experiments on the movement of water in soils, with a discussion on the results obtained therefrom. As the wells are all sunk in the chalk, which lies comparatively close to the surface at Rothamsted, their waters will not be altogether comparable to those from wells on Canadian farms. A detailed account of this work will not therefore here be necessary. To the chemist however, if not to the practical agriculturist these data are intensely interesting and exceedingly valuable

We should very much like to see these lectures published in Canada in order that the agriculturists throughout the Dominion could obtain with facility copies for study. All progressive farmers must now make themselves conversant with these and kindred subjects, and those who wish to be thoroughly posted to date on the important question of nitrification should carefully read this succint account by Mr. Warington of the classic researches at Rothamsted.

Next year the second course of lectures will be given, and I think that our agricultural authorities should well consider the advisability of asking from the trustees of the Lawes Agricultural Trust for their delivery, or at least their publication, in Canada. Ours is a British Colony, whose chief industry is agriculture, and I feel sure that Sir John Lawes and his co-workers would be wishful for his fellow country men in this way to participate in the results of their labours.

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EXCURSION III—TO NORTH WAKEFIELD, QUE.

SEPTEMBER 3RD, 1892.

Two hundred and twenty-eight members and friends of the Club left the Union Station on Saturday, the 3rd day of September to attend the third of the series of regular excursions for the present summer.

La Pêche Village, North Wakefield, was the place selected by the Excursion Committee and recommended to the Council of the Club. All arrangements having been completed, the party left the city at 10 a m. and crossed the Ottawa River on the Ottawa & Gatineau Valley Railway, and then proceeded northward to Ironsides and Chelsea. Then plunging headlong into the picturesque country of the Laurentide hills. along the eastern edge of Table Mountain, Kirk's Ferry, the Cascades, and many other enchanting spots were passed in rapid succession. In less than an hour the excursionists were at North Wakefield, where a long line of dwellings, skirting the shore of the Gatineau River, form the village which is situated in the inner curve of a large circle which touches the round and crescentic hills, lending a peculiar aspect to the whole country.

Mr. F. T. Shutt, M. A., the Acting President, then addressed the gathering and gave out the programme, naming the leaders in the different branches and the most interesting spots to visit.

The time for *rendez-vous* was given for four o'clock at the School House near the bridge on the Pêche River. As the noon hour was fast approaching the first thing discussed was the contents of the lunch baskets. Under the verdant boughs and in shady nooks of the beauteous and abundant vegetation, all around there could be seen many a group of Naturalists enjoying the mid-day meal in the open air, the blue canopy of a charmingly warm and delightful early September sky o'erhanging all.

At about one o'clock the different parties began to ascend the hillside, the botanists, geologists and entomologists vieing with one another as to who would get to the top first and would obtain most material of interest. Many a group of observant students of nature could be seen halted along the hillside and surrounding the leaders, who there on the spot, would examine and describe the plants or rocks and formations of the locality, and explain the interesting forms and phenomena visible. It was nearly five o'clock before the party had returned and gathered at the School House, where a number of addresses were given, as is the custom on these occasions.

The first to speak was Mr. J. Fletcher on "Insects and Insect Life." There were two kinds of insects noted and described—the *beneficial* and the *noxious* insects. These comprised many species and genera. Mr. Fletcher described many of these and gave ready rules whereby beneficial or noxious insects might be distinguished, pointing out the economic relations and significance of these creatures in the world. He exhibited several kinds of plant-galls and described the insects which caused them, he also spoke of the parasitic and guest insects which are found in large numbers in galls of all kinds. The great value of parasitic insects in the economy of nature was illustrated by an account of the good services performed during the past season in Western Ontario where almost every specimen of the Grape Vine Sphinx and the Tomato Sphinx was found to be parasitised by enormous numbers of a small enemy called *Apanteles congregatus.* No less than 207 of the latter having emerged from a single Caterpillar of the Tomato Sphinx. The egg parasites of insects, *Proctotrypidæ*, were also described, and an interesting account was given of the egg-parasite of the too-well known Currant worm, *Nematus ribesii.*

Then followed Mr. R. B. Whyte, leader in Botany. In his usual happy manner he described the plants that were observed and collected during the day, mentioning the salient characters and peculiar habits of several of these, as also their usefulness to man and other creatures. He had observed that a very large proportion of our commonest plants in open places were introduced from Europe. Many of these, as the thistle for instance, had become very noxious weeds. The majority of plants met with during the day were common place specimens. Upwards of sixty different species were observed and noted in blossom. Of these the Golden-rods and Michaelmas Daisies formed a conspicuous lot. The following representatives of the Golden-rods (*Solidago*) and Michaelmas Daisies (*Aster*) were jotted down.

Solidago squarrosa.
" bicolor, v. concolor.
" rugosa.
" Canadensis.
" lanceolata.
" latifolia.

Aster cordifolius.
" diffusus
" puniceus.
" macrophyllus.
" paniculatus.
" Lindleyanus.

Epiphegus Virginiana and Rudbeckea hirta, one very humble and the other a very conspicuous flowering plant were also collected and are worthy of note. Of trees, the elm, linden, maple, oak and birch trees are conspicuous and beautiful at North Wakefield. It is expected that the list of species observed on this occasion will be greatly increased on some future visit by the Club to the locality.

Prof. Macoun was then called upon to address the gathering, and dwelt at length upon the relation of knowledge acquired from books and of that acquired from personal observation and contact with Nature. He also described the forest trees which were to be seen all about, and applied the principles he had laid down in determining these at a distance.

Dr. Henry M. Ami spoke next. In a rapid manner, as the time for re-assembling at the station was fast approaching, he gave a general sketch of the geology and physical geography or history of the district. The rocks consisted chiefly of a hard compact, more or less coarsely crystalline, syenite, or Hornblendic granite, with a tendency to lamination or foliation, resembling gneiss. This primitive or Laurentian rock —fundamental gneiss, sometimes called—was seen to be intersected by a small dyke of dark hornblendic material, resembling a dolerite, fine grained and compact, rather tortuous in its course, but in a general north-east and south-west direction. From the summit of the mountain north-west of Wakefield Village, the valleys of the Gatineau and Pêche Rivers could be seen, and Table Mountain lay to the south some 8 or 10 miles distant. In the lower portion of the Pêche River valley the rocks were found to be glaciated, grooved and polished during the "Great Ice age," by the Pêche glacier which used to descend and meet a larger one in the present Gatineau River valley. It deposited morainic drift along both sides of the valley, but left little along the points and curves of this meandering valley. Whilst the summit of the mountain itself is rounded, but not grooved nor polished, the gneissoid rocks along the road and below the mills are beautifully polished, indicating the existence of a glacier.

In bringing the pleasant excursion to a close Mr Shutt congratulated those present on the charming outing they had all enjoyed. He said that this would probably be the last of the Summer excursions, but that Dr. George Dawson, the President, had now returned to Canada and doubtless he would be untiring in his efforts to assist the Soiree Committee in arranging a good programme, for the winter meetings, which would appear in the OTTAWA NATURALIST shortly. He trusted that the large attendance at the summer excursions might be taken as an earnest of what we should see at the winter meetings.

The city was reached at 7.30 after a rapid and pleasant journey.

A water-colour sketch of the bridge and Pêche River, made by Miss Lizzie Perkins, a member of the Club, was much admired by all who saw it. Mrs. Chamberlin was also busily engaged in adding to her now extensive collection of paintings of native fungi, and secured some valuable specimens through the kind services of Prof. Macoun.

H. M. A.

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ORNITHOLOGY.

EDITED BY A. G. KINGSTON.

ALBINISM IN THE "ENGLISH SPARROW" (*Passer domesticus*).—As time goes on and this introduced species comes more thoroughly under the influence of our dry climate with its extremes of temperature, the appearance of occasional individuals lacking the usual quantum of colouring matter in parts of the plumage seems to grow more frequent. From colonies planted in Boston and New York about thirty years ago, the sparrow made its first appearance in this northern latitude about 1872. Until recent years a sparrow showing white markings (apart from the normal pattern of the species) was looked upon as a rarity; now almost every large flock about the streets and gardens, if closely examined, will be found to contain at least one bird with here or there an odd white feather.

These marks are generally irregular, but occasionally a definite pattern is noticeable. The writer has in his possession a specimen, taken in May last, in which the secondary wing-quills are wholly white and the tail white with a slight bar of grey at the tip. Mr. Fletcher reports having seen one of somewhat similar plumage a few days ago in Ann Street. The following patterns have also been observed:—

(1) A male with the usual black patch on the throat surrounded with a border of white, which also extended as a white collar around the neck.
(2) One with white secondaries.
(3) One with two parallel white stripes between the shoulders.
(4) One with the whole crown white.

Any of the readers of the NATURALIST who may observe cases of albinism, or of the opposite peculiarity, melanism, an undue darkening of the plumage, in sparrows would confer a favour by sending a short note to either of the leaders of the Ornithological Section.

MIGRATION NOTES.—The migration of birds is to most persons one of those mysterious movements of nature which they are compelled to believe in, but whose processes can hardly be expected to be made evident to the senses. Our feathered visitors disappear in autumn and return to sight in spring, but the number of persons, even among those most interested, who have ever seen a flock of migrants in their northward or southward flight is remarkably small. With the exception of some of the larger waterfowl and hawks, nearly all birds of passage pursue their journey at night, and generally at a great height in the air. From observations made a few years ago at an astronomical observatory near New York, upon migrants seen with a telescope passing across the face of the moon, it was calculated that these birds were flying at a height of from 1 to 4 miles above the earth. The theory now pretty generally accepted by those who have made these movements a study, is that the birds are guided in their course by rivers and the sea coast, the line of water being easily traceable by moonlight or starlight on a clear night, even at these great altitudes. When the weather is dull or stormy, however, and especially when a haze hangs low down, obscuring the landmarks, the travellers are forced to fly low. At these times, although it is not often possible to see them, their rallying calls may frequently be heard with great distinctness.

One of the best points about Ottawa for such observations is the Maria Street bridge over the Rideau Canal. The Gatineau River to the northward with the first stretch of the Rideau on this side, form an almost due north-and-south line for about 250 miles, and no doubt compose one link in the chain of landmarks followed by the birds in passing between the Hudson Bay region and the Atlantic coast of the Southern States. On almost any dull night during the season of migration—April and May for the northward movement and September and October for the southward—at an hour when the noises of the streets have somewhat quieted, the cries of the passing birds can be clearly heard. Very often too, the direction of the flight of certain individuals or small groups may be traced with reasonable certainty, showing the course at the former season to be "down" the canal, i.e. north-westerly at this point, and in the autumn months in the contrary direction. The identification of species in the darkness is a more difficult matter. The rallying cries of most birds differ considerably from the songs and calls which we know so well in the daylight. Still there are a few species whose voices are familiar enough to be recognized at any time. The cry of the Greater Yellow-leg Plover (*T. melanoleucus*) is at once striking and easy to imitate, as every sportsman knows. One night last fall this call was heard, and on imitating it the writer had the satisfaction of eliciting an answer several times repeated as the bird passed on up the canal. This year the nights of the 15th and 18th September were marked by a great movement of birds. On the 15th at about 10.30 p.m. there was a fine rain driving before a south-westerly wind, and the birds flew unusually low. They seemed from their cries to be chiefly warblers and sparrows (native) though sometimes the cries of various shore-birds could be heard at a greater height. Frequently small birds of the warbler family, struggling with the storm, would almost dash against the electric lamp which stands upon the bridge, circle a number of times round it and then pass away into the darkness. The night of Sunday, the 18th, was more favourable for the identification of species. Shortly after midnight a thunderstorm came up from the south-west, and during the dull quiet period which preceded it the calls of the passing birds were so frequent and distinct as at times to become a positive clamour, attracting the notice of casual passers-by, who would stop and look up into the darkness in astonishment. The voices of the Robin, the Bluebird, the Goldfinch and the Greater Yellow-legs above mentioned could be recognized, and other calls, though not to be identified, were clearly assignable to the warbler family, the *limicolæ* (snipe and plover) and various native sparrows. The main column of this army of birds evidently confined itself to the immediate neighbourhood of the canal, for at a distance of a few blocks on either side, the cries became much less frequent, though once in a while a bird or two evidently confused by the multitude of lights, would fly out in wide circles over the city screaming distractedly. Probably another column might have been found following the parallel course of the Rideau River about a mile to the eastward until it and the canal converge and meet a few miles south of the city. In the city papers on the following Monday reference was made to some of these phenomena, and at least two birds (partridges) were reported to have been found, killed no doubt by striking electric wires or posts.

Several nights following this were clear, and no migrants came within "earshot." That of the 22nd was to all appearances similar to the 18th, but no movement was discernible. On the 24th the birds were again on the wing, though not in such numbers nor so clearly to be heard as on the previous occasion.

ENTOMOLOGY.

EDITED BY W. HAGUE HARRINGTON.

The cool nights and light frosts which occured in September have had a marked effect on the abundance of insect life. On bright days Clouded Yellows and White Cabbage Butterflies have been abundant, and towards the end of the month a third brood appeared of both the Nettle Butterfly (*Vanessa Milbertii*) and the Camberwell Beauty (*Vanessa Antiopa*). After a few trials of their newly gained wings, these gems of the summer landscape will seek some quiet nook in cave or hollow tree, and sink into a state of torpor from which they will only be aroused by the returning warmth of opening Spring. On Sept. 25th a single specimen of Peck's Skipper (*Pamphila Peckius*) was seen sipping the nectar from a stalwart Michaelmas Daisy (*Aster puniceus*).

Several caterpillars were sent to the leaders during the month. Hidden in a den made by catching together two or three leaves of *Salix cordata* or other rough-leaved willows, the solitary caterpillars of *Nisoniades Icelus* were several times found. These have pale green slug-shaped bodies with large brown heads, separated from the body by a small neck. They apparently pass the winter in the caterpillar state.

The beautiful black, yellow and white Zebra caterpillars of *Mamestra picta* have been very abundant and destructive. Their numbers, however, have been much reduced by a minute parasite of the Proctotrypid genus (*Trichogramma*) which passes all its preparatory stages inside the egg. The moth which lays the egg from which the Zebra caterpillars hatch, deposits from 100 to 250 in a flat patch on the under side of a leaf. Of over twenty of these patches collected in the beginning of September, not a single egg produced the caterpillar, but instead the minute parasite above named. The same microscopic benefactor, or a closely allied species, did good service in destroying the egg of the Imported Currant Saw-fly, and of a new imported enemy of the willow which has only lately appeared in America in the shape of another Saw-fly (*Nematus pallidiventris*). The event of most importance in this line is the sudden and wide-spread appearance in Canada of the Cattle Horn-fly (*Hæmatobia serrata*). The habits and the best remedies for this pest are all given in the recently issued Bulletin 14 of the Central Experimental Farm.—J. F.

BOTANY.

EDITED BY WILLIAM SCOTT.

ASTER NOVÆ-ANGLIÆ, varietal forms (1).—The only station in the vicinity of Ottawa for this fine Michaelmas Daisy is Casselman, where some clumps bearing flowers of a beautiful pure white were found on Sept. 10, growing with the ordinary form.—W. S.

(2) Another beautiful form was brought from Toronto by Dr. J. E. White, bearing flowers which varied from pale mauve to deep lilac. The flowers which opened first were deepest in colour.—J. F.

GENTIANA SAPONARIA.—Dr. White also brought with him to Ottawa fine flowering specimens and living roots of this rare Gentian. The roots, with some other rare plants presented by Dr. White, are now planted in the herbaceous border of the Botanic Garden at the Central Experimental Farm.—J. F.

HELIANTHUS DECAPETALUS.—A noticeable feature of the Ottawa woods in Autumn is the absence of all species of wild sunflowers. *H. decapetalus*, however, occurs at Casselman and is apparently becoming more abundant there than formerly.—W. S.

GLYCERIA ELONGATA.—This is one of our most local grasses. It has been found sparingly at Kingsmere, but at Casselman it occurs in almost every damp gully.—W. S.

POTATO ROT.—A good object lesson demonstrating the value of scientific knowledge, is to be seen just now at the Experimental Farm. Some potato plants which were twice sprayed with Bordeaux Mixture to prevent the blight are now perfectly covered with green leaves, while all the others around them, and even in the same row, which were not treated, have been brown and dead for three weeks.—J. F.

UMBRELLA MUSHROOMS.—Those botanists of the Club who are lucky enough to know the gastronomic qualities of *Coprinus comatus* have lately enjoyed many dishes of this delicious mushroom. No other fungus resembles it. The shape is at first elongated oval or egg-shaped, but later like a half-closed umbrella, from 3 to 10 inches in height, white when young and covered outside with small brownish hairy tufts. When old it deliquesces into a black inky fluid.—J. F.

MINERALOGICAL NOTES.

Manganese Ores in Canada, by H. P. Brumell, Ottawa.—The August number of the *American Geologist* for 1892, contains an interesting as well as useful contribution regarding the distribution, origin and geological relations, as well as economic uses and value of the ores of manganese in Canada.

We are informed here that all the known workable deposits are located in New Brunswick and Nova Scotia, and belong chiefly to rocks of the lower carboniferous age, whilst the "bog ore deposits, being of recent formation, are found overlying rocks of any formation from the Cambrian upwards."

From the Markhamville deposit of crystalline ore, Mr. Brumell informs us, upwards of 20,000 tons have already been shipped. The analyses of this ore are also given, and reference made to another important deposit in the same (Sussex) County in New Brunswick, at Jordan Mountain, where some 400 tons of from 80 to 85 per cent. ore have been extracted from the western side of this mountain. At Quaco Head and Gowland Mountain crystalline ores of manganese also occur. At the latter locality it "consists principally of psilomelane and fills the interstices of a very much broken and partly decomposed granite of Pre-Cambrian age." Upham, Waterford, near Petitcodiac, Springfield, Tête-à Gauche Falls and Albert County. The Shepody Mountain deposits have been described by Dr. R. W. Ells in his report (1884) and shows that the ore "consists of pyrolusite and psilomelane, and occurring in the base of conglomerate in irregular pockets."

"Wad" is the common name which miners give to that ore of manganese which is found in swampy districts, and is of recent origin and still in process of formation in many places.

The most important deposits of "wad" occur at Dawson Settlement in Albert County, N. B, "where many acres of ore are found, the beds varying in extent and depth, and attaining in some places a thickness of over forty feet, to which point they have been proved." Analyses of this easily worked ore are then given by Mr. Brumell from the reports by Messrs. W. F. Best, of St. John, N. B., and John Burwash, showing the percentage of manganese binoxide "to vary from 35.5 to vary from 73 6; the average being about 60 per cent. So much for New Brunswick ores.

In Nova Scotia the production of manganese is not so great, although the mode of occurrence and treatment of the ore is similar to that in New Brunswick. Pyrolusite—the high grade ore of manganese—is more widely distributed. "On the south shore of Minas Basin and midway between Noel and Walton, is situated the best-known and most important manganese mine in Nova Scotia, the Teny Cape mines, which, since its discovery in 1862, has been operated more or less continuously." Pyrolusite and manganite occur here, and assays are given of specimens from "Teny Cape," "Cheverie" and "Douglas" locations, made by Dr. Howe, E. Gilpin, Jr., and H. Poole respectively. These indicate 85.54, 90.15 and 84.62 per cent. of manganese oxides present in ihe ore.

On Cape Breton Island, the Hon. E. P. Moseley, of Sydney, C.B., has discovered and developed deposits of pyrolusite which promise well. they are situated near Loch Lomond, and Mr. Brumell adds the report made by Mr. Hugh Fletcher, of the Geological Survey staff, in his report, addressed to the Director. for 1882-83-84. Upwards of 91 per cent. of manganese dioxide occurred in this ore according to an analysis by Mr. Frank Adams.

Ontario and Quebec, etc., afford but small deposits of manganese ores. In Stanstead and Bolton Townships, in Quebec, and in the Magdalen Islands (teste J. Richardson in his report for 1879-80), as well as near Batchewaherung Bay, Lake Superior, in Ontario, together with a band of manganiferous spathic iron ore in the Nastapoka Istands off the east side of Hudson's Bay, appear to be the only places where ores of manganese are yet known outside of the Maritime Provinces.

FOSSIL REMAINS.—It might be added here that a number of fossil remains have been found in Nova Scotia and New Brunswick entirely filled and the hard parts replaced by pyrolusite. Amongst these is an interesting ann well-preserved specimen of a pteropode (Conulara allied to B. planpcostata, Dawsan) from the Lower Carboniferous of Springfield, where it was collected by Mr. A. E. Barlow in 1884.

H. M. A.

EDITORIAL NOTES.

THE PRESIDENT.—We are much pleased to welcome safely back again Dr. George M. Dawson, C.M.G., F.R.S., &c., our President, who has just returned from England where he has been engaged for five months in connection with the Behring Sea arbitration. We congratulate Dr. Dawson upon the important work which has been entrusted to him by the Imperial authorities, and also on the latest honour which it pleased Her Most Gracious Majesty the Queen to bestow upon him last May in recognition of his many services to science. This last distinction was Companion of the Order of St. Michael and St. George. (C.M.G.)

DR. ADAMS.—Mr. Frank D. Adams, M. App. Sc., and late of the Geological Survey Staff at Ottawa, spent the summer in Germany where the University of Heidelberg conferred upon him the well-earned title of Doctor of Philosophy (Ph. D.).

SCIENCE-TEACHING AT OTTAWA.—At the last general excursion of the Club to La Pêche, there were no less than 80 students from the Normal School. This speaks well indeed for the Science Master at this institution, and shows plainly that Mr. William Scott is not merely a teacher from text books, but leads his students out into the fields, where alone can be acquired a practical acquaintance with the objects which they have to study. No greater compliment than this, we think, could have been paid Mr. Scott by his pupils, and we feel sure that he must have been much encouraged by this practical and well-merited expression of approval of his method of teaching. We hope that at some future time the Science Master of the Collegiate Institute may also see the benefit of availing himself of the advantages offered at the Club meetings of furthering the important work with which he is entrusted.

AUTHORS' EXTRAS.—At a recent meeting of the Council of the Club it was decided to give to any member who contributed an article of more than two pages in length, ten copies of the number of the OTTAWA NATURALIST which contains his article, upon his making application to the Editor or the Librarian at the time of publication.

THE WINTER LECTURES.—The Soiree Committee will be pleased to receive from members, as soon as convenient, the titles of any papers which they may wish to read before the Club during the coming winter, and at the same time an intimation as to the time which will be most convenient.

CASTOROLOGIA.—The Editor begs to call the attention of readers of the OTTAWA NATURALIST to the advertisement of the above work on the last page of the cover. This work is by Mr. Horace T. Martin, of the Montreal Natural History Society, who gave us the pleasure of his company at our Spring Excursion to Butternut Grove in 1889, and spoke so acceptably to the members of the Club. Mr. Martin has made a most careful study of his subject, and has had peculiar facilities for getting information. He is a pleasing writer, and we feel sure that all who obtain his work will be satisfied.

THE GEOLOGICAL SOCIETY OF AMERICA.—Prof. H. L. Fairchild, of Rochester, N. Y., Secretary of the Geological Society of America, has sent the following notice to the Fellows of that society with reference to the next meeting :— "In response to a cordial invitation from the Royal Society of Canada and the Canadian Geological Society to this Society to hold its next meeting in Ottawa, the Council has determined that the fifth winter meeting shall be held in the City of Ottawa, beginning December 28th, 1892."

As a large number of the members of our Club take a deep interest in geological matters, professionally and otherwise, it is anticipated that the geologists from all parts of the North American Continent who will be present on that occasion will meet with a hearty reception at the hands of our members. Ottawa possesses sufficient attractions and interest in geology to make this meeting one of the most successful ever held.

Papers bearing on the geology and history of various parts of this Continent will be read, the discussions of which will doubtless be both profitable and interesting.

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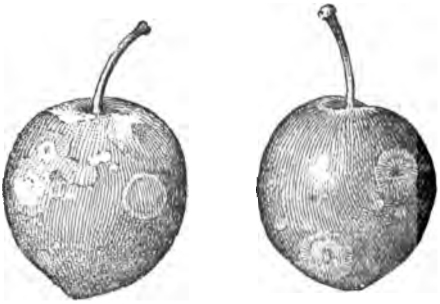
A DESTRUCTIVE DISEASE AFFECTING NATIVE PLUMS.

Cladosporium carpophilum, (v. Thümen.)

By John Craig.



(*Cladosporium carpophilum.*)

During the past two years many complaints have been received from farmers and fruit growers in regard to a disease which has caused their red plums to shrivel and drop quite suddenly when almost mature. In many sections during the past season the crop has been an entire failure. As the disease appears to be spreading, it would seem that in the near future very active measures should be instituted to check its increase.

Prof. L. H. Pammel, of the Iowa Agricultural College, who has given the disease special study, has kindly supplied me with the following facts, which I quote in his own words:—

"My first acquaintance with this disease as affecting our cultivated plums was in 1889.[1] The disease having appeared very destructive to certain plums since that time, and the fungus has been on the increase.

This spotting is caused by a parasitic fungus, *Cladosporium carpophilum*, which is abundant on peaches, especially on the later varieties. So injurious is it to certain varieties that Dr. Smith[2] finds that it not only injures the appearance of the fruit somewhat, but when very abundant the flavour also. I have heard growers in Texas speak of it as nothing serious, but to my mind there is no question that it greatly lessens the crop, and also causes a cracking of the fruit as Dr. Smith finds, making it especially subject to the attacks of *Monilia fructigena.* Several other species of *Cladosporium* are troublesome, the *C. cucumerinum*, Ell. and Arth. is troublesome to cucumbers. Several species are troublesome to grapes. The *C. viticolum*[3] occurs on *Vitis labrusca*, and *V. vinifera*. A species was common in New York, in Clinton,[4] according to Mr. Fairchild. *C. roesleri*, Catl. on the European cultivated grape (*Vitis vinifera*) in Europe.[5] The Apple Scab (*Fusicladium dendriticum*) is a fungus closely related to the plum fungus,[6] and without doubt will seriously threaten plum culture.

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[1] Meeting of Iowa Academy of Sciences, Sept. 5, 1890.

[2] Journal of Mycology, Vol. V., p. 32.

The spots are visible in half ripe plums as small pale greenish or yellowish patches not larger than a pin head. They increase in size, becoming in some cases half an inch across. Some of the older spots may become confluent, forming one large more or less radiating patch. Patches may be formed in nearly mature plums. In old specimens which have been kept moist for some time the spot becomes darker in colour, almost black, more irregular and raised.

Microscopic examination of the affected portions of the plum shows a nearly colourless mycelium creeping over tke surface or vegetating between the cuticle and the remainder of the epidermal cells. In the darker portions occur the septate hyphæ, these occasionally come through the cracks in the cuticle. In older material a dense stroma of short brown hyphæ appears between the cuticle and cellulose layers of the epidermal cells. The small spores are oval in shape, pointed at the end and usually two-celled, and are borne at the end of the conidiophore, or laterally. They germinate readily when placed in water.

The chief injury caused by this fungus is the cracking of the plums, allowing *Monilia fructigena* a chance to work. The injury, however, does not extend much beyond the point of attack and only a small number of the plum cells become brown. The fungus, no doubt, also, checks the development of the plum, and in the severer cases it causes a shrivelling of the fruit. The fungus seems to occur on all kinds of the American plums. Here at Ames I have noted it on the following species and varieties: Pattowattamie (*Prunus augustifolia*), Miner (*Prunus hortulana*, var. *Mineri*), Maquoketa, DeSoto, Rollingstone, Speer, Chippeway, Black Hawk, Hen Plum (*Prunus Americana*), Sloe Plum (*Prunus spinosa*). Mr. F. C. Stewart reports this fungus at Greenfield, Iowa, on wild and cultivated plums, in some cases it ruined half the crop. I have also seen it very common on wild plums at Cedar Rapids, Iowa, and Mr. Stewart also found it at Marshalltown, Iowa. Mr. Geo. W. Sturtz reports it at Plainview, Nebraska, and Mr. John Wragg at Nankee, Iowa, and my friend, Prof. Craig, of Ottawa, Canada, writes me that it was common in Minnesota on cu'tivated Cheney, DeSoto, Rollingstone and Speer; That it also occurs on the common Wild Plum and cultivated varieties in Canada; also in Virginia on *P. Americana.* It did not appear at the Experimental Farm, Ottawa, in 1891. From this it will be seen that this fungus has become widely distributed and destructive. The disease is certainly on the increase. It did not appear to any extent this year here at Ames, except upon a few chickascaw and sloe plums. As plums fruited but little, I have not seen it attacking *Prunus domestica* at Ames. The *Cladosporium* has become a serious enemy to cherries, first noticed in 1891 when it destroyed from 2 to 10 per cent. of the crop. First appearance is marked by a pale coloured spot not larger than a pin head, which increases in size, and finally is olive green in colour. As in plums a crack is frequently found extending across the patch. The cherries are also badly shrivelled in many cases, somewhat bitter and sour. We noticed the following varieties affected in 1891: Cerise Ostheim, Spate Amarelle, Shadow Amarelle, and Wagner, and in 1892, although the cherry crop was small, the disease appeared on many cherries; my assistant Mr. Stewart has furnished me with the following list: Lutooka, Shadow Amarelle, Schatten Amarelle, Spate Amarelle. It will be noticed that this list only contains Russian varieties. Most of the cherries grown on the college grounds are Russian. Early Richmond growing not far from the college was not affected by the disease; it may have appeared in other places, but I have not heard of any, or at least specimens were not sent to me. Experiments with fungicides would have been made this season, but the plum and cherry crop was almost a failure and hence no experiments could be made.

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[3] Soraner Pflanzen Krankheiten, Vol. II., p. 401.

[4] Jour. of Mycology, Vol. VI., p. 99, Scribner, Diseases of the grape vine. Bull. 2, Dept. of Agricul., Rep. 1886, p. 3. Galloway, Jour. of Mycology, Vol. V, p. 93.

[5] Soraner Pflanzen Krankheiten, Vol. I., p. 401.

[6] See Bailey. The cultivated native plums and cherries, Bull. 38, Cornell University, Agrl. Experiment Station, p. 54. Pammel, Jour. of Mycology, Vol. VII., p. 99.

As this fungus works very much as Apple Scab there is no reason why the fungicides for that disease should not prove effective. But treatment should begin soon after the petals have fallen, and should be continued till nearly the ripening period."

In addition to the remedies recommended by Prof. Pammel I would suggest the use of a weak solution of copper sulphate, say 1 oz. in 25 gallons of water.

I shall be glad to receive any additional data regarding the progress and life-history of this fungus. It is of special importance to fruit growers in the Ottawa Valley where we are debarred by climatic conditions from growing many of the *Prunus domestica* family of plums bearing fruit of finer quality but less vigorous and hardy in constitution.

It may be mentioned that this is a new disease and although it has received considerable attention from economic botanists during the last three or four years was only described by Felix von Thümen in 1887.

:o:

ORNITHOLOGY.

EDITED BY A. G. KINGSTON.

SNOW BIRDS.—The first Snow birds of the season were seen on the 24th October, when a large flock of about 200 alighted on the Experimental Farm. Another flock was noticed by Mr. John Craig at St. Hubert, Que., on the 22nd October.—J. F.

NATIVE SONG BIRDS.—Mr. Charles Hughes, who has been spending the summer at Wakefield, in the Laurentian Hills has been studying our native song birds. He has promised to send us soon some notes on between 20 and 30 species which he has observed. He kept many of them round his house by feeding them with seeds of different kinds. For this purpose he sowed a large quantity of Sunflower, Millet, Hemp, and Canary-seed, and the pleasing result has been that many kinds seldom seen, have stayed around his residence throughout the summer. Mr. Hughes has also made collections of insects and other natural history objects.—C. E. D. Chubbuck.

HUDSONIAN CHICKADEE (*Parus Hudsonicus*).—A specimen of this rather rare northern bird was seen in an orchard in Ottawa East on the 23rd October.—W. A. D. Lees.

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ENTOMOLOGY.

EDITED BY W. HAGUE HARRINGTON.

CALOSOMA SCRUTATOR AT OTTAWA.—A single wing-case of this magnificent beetle, not previously recorded from Ottawa, was found by Mr. Andrew Halkett upon Parliament Hill. Judging from the fresh appearance of the fragment, the specimen had been recently killed. This species is frequently found in Western Ontario and is sometimes washed up along the shores of Lake Ontario in large numbers, but the only other record from this part of Canada is a single specimen taken by Mr. J. D. Evans at Sudbury, Ont.— J. F.

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BOTANY.

EDITED BY WILLIAM SCOTT.

AUTUMN TINTS.—The foliage this year about Ottawa lacks the usual variety and brilliancy of tints usually seen. Cold weather without frost seemed to hasten the process of decay without bringing out the glowing colours.

On this subject of colours some trees seem independent of weather in the matter of autumnal clothing. *Acer Ginnala*, a dwarf maple from the valley of the Amur River has been as glowing as ever in its garb of bright red, looking in the distance like a ball of fire.

The Red Oak, too, with its rich crimson plumes is always reliable. A row of these, in the Experimental Farm nursery, along side of the yellow gold of the Cut-leaved Birch, presents an effect very pleasing to the eye. Cut-leaved Sumach (*Rhus glabra*, var. *laciniata*) at this time in point of colouring is identical with the sturdy oak, but presents a great contrast in the delicacy of its outline. Scarcely less conspicuous but of a different shade of red are the bushes of the beautiful dwarf Barberry (*Berberis Thunbergi*) and the different Dog-woods (*Cornus*).

The Purple-leaved Plum still holds its summer garb like the oak and will retain it until severe frost loosens its grasp. The foliage is of a deep maroon-purple. Many shrubs and herbaceous plants when touched by frost take on a purplish shade; this is sometimes very bright on the Red and Silver Maples and the White Ash. In the Smoke Tree (*Rhus cotinus*) the leaves appear to have been delicately washed with rose madder while the Scented Sumach (*Rhus Canadensis*) varies from pale yellow to bright scarlet or purplish bronze.

Bronze prevails to a large extent in the autumn foliage. Raspberries and Strawberries are frequently very beautiful and the Wild Roses are rendered most attractive objects. The heavy rich foliage of the Japanese *Rosa rugosa* is much improved by this autumn bronzing and as it holds its leaves and handsome fruit for a long time it is a useful shrub for ornamental grounds.

Particularly beautiful is the crimson and gold autumn foliage of *Pyrus arbutifolia*, and although less vivid in colouring the golden yellow of the various poplars and hard maples add much to the glory of the autumn landscape.—John Craig, Ottawa.

IMPOTENCY OF HYBRIDS.—The fact that many varieties of the Rogers and other hybrid grapes are dependent on cross fertilization was clearly brought out, owing to the peculiar state of the atmosphere during the blossoming period this year. A humid atmosphere with frequent showers prevented in a large degree intercrossing by wind or insects, and consequently we find a number of varieties comparatively unfruitful, which in favourable seasons are uniformly productive.—John Craig, Ottawa.

ANTHRACNOSE or Bird's-eye-rot (*Sphaceloma ampelinum*) is creeping into vineyards in the vicinity of Ottawa and may prove very destructive in the future. All diseased wood, leaves and fruit should be burned this autumn and the canes and trellises sprayed with a solution of iron sulphate one pound to 25 gallons.—John Craig, Ottawa.

FUSICLADIUM ON CHERRY.—It is feared, judging from the indications of last season, that the disease known as "Apple Scab" or "spot" (*Fusicladium dendriticum*, Fckl.), which has thus far principally affected the Apple and Pear, is likely also to prove dangerous to the Cherry. A single variety only was affected in the Experimental Farm orchard this year, but so severely as to cause the loss of the entire crop. Gruner Glas (?) the variety attacked, is one of Prof. Budd's importations from Eastern Europe. Two trees of this variety were growing vigorously and were heavily laden with fruit which was nearly mature when the disease was first noticed. Specimens were sent to Mr. D. G. Fairchild, Assistant Vegetable Pathologist, at Washington, D. C., who identified the disease as the true *Fusicladium* of the Apple. The foliage was also attacked but less severely than the fruit.—J. Craig, Ottawa.

A FERN NEW TO CANADA.—An addition to our Canadian Ferns in the shape of *Asplenium ruta-muraria*, L., has been made this year by Dr. P. J. Scott, of Southampton, Ont., who discovered it growing plentifully on the rocks of Flower Pot Island, about four miles from Tobermorey, a small place near Cape Houd in the north of Bruce Co., Ont. The specimens sent me for determination are very fine and typical. The nearest before known stations for this interesting species were in Vermont and Michigan, U. S.—T. J. W. Burgess, Montreal.

INTRODUCED PLANTS.—The three North Western plants *Helianthus rigidus*, *Lepachys columnaris*, and *Grindelia squarrosa*, which were reported last season by the Botanical Section as having been found near Eddy's old mill-yards at Birchton, were again noted in the same locality a few weeks ago. It does not seem probable that the two first named will prosper in their new home, as no vigorous specimens were met with; but *Grindelia squarrosa* has evidently struck a very congenial habitat. The number of plants of this species has greatly multiplied since last year while its territory is very considerably enlarged. Many stout thrifty specimens were noticed even on a well-beaten road. An interesting feature of this plant is its profuse resinous-viscid coating.

Several fine specimens of the Walking leaf fern (*Comptosorus rhizophyllus*) were gathered at old Chelsea on Oct 15th. The past season seems to have been very favourable to its growth as it was found in greater profusion than usual, nearly every shady nook of the calcareous rocks abounding with it. In our region the best specimens are to be had in the late autumn and members of the Club who are interested should seek it without delay.

Last year a large colony of Moth Mullein (*Verbascum blattaria*) was discovered in on old pasture near Mechanicsville, but no trace of it could be seen this summer. The plant is rather scarce in the vicinity of Ottawa, and although it has been found at various points near the city during the past few years, it seems not to persist with any degree of certainty in any one place.

Euphorbia marginata, an annual indigenous to the North Western States, was introduced into the Ottawa district from Dakota some years ago. A few seeds sown in a garden near the city two years ago, produced vigorous plants, which cast their seed in the autumn, and gave rise this year to a numerous colony of sturdy offspring, with every indication of survival of the species. The showy white-margined floral leaves render the foliage rather attractive. It is known among the Dakota Indians as "Snow-on-the-mountain."

A beautiful albino form of *Verbena hastata* (Blue Vervain) was collected recently near St. Patrick's Bridge. There is much to be learned yet about these interesting variations of nature, and if all members of the Club who happen on such specimens would carefully note the surroundings, and grow the plant for future observation, more light might soon be thrown on the matter.—R. H. COWLEY.

ALBINO LIATRIS.—Some four years ago the Rev. W. A. Burman, at that time working as a missionary amongst the Sioux Indians at Griswold, Manitoba, sent to the Botanic Garden at the Central Experimental Farm, a root of *Liatris scariosa*, which bore pure white flowers. This plant is now growing vigorously, and bears every year several beautiful spikes of pure white flowers. Several plants, however, which have been grown from its seed, flowered for the first time this season, and all of them bore flowers of the ordinary reddish-purple colour of the species. The original plant was grown in a group containing four roots of the ordinary form. Next year it will be separated and seeds again planted, and it will be interesting to find if the white form can be perpetuated. Seeds of this year's seedlings will also be sown, and these, perhaps, may give white offspring. As in some animals, a second cross may be necessary to produce change from a long established form.—J. F.

MACKENZIE RIVER NOTES.—During the summer just past Miss Elizabeth Taylor, daughter of the United States Consul at Winnipeg, (who has been well known to Canadians since more than twenty years ago as "Saskatchewan Taylor," owing to his persistent and wise advocacy of that region as the great wheat field of the future), made a trip by the Hudson Bay Company's steamer from Athabasca Landing on the Athabasca River, ninety miles north of Edmonton to Peel River in the delta of the Mackenzie River and far north of the Arctic Circle. The total length of the trip was about 1,500 miles and in a generally northward direction.

Although the trip was not make primarily in the imterests of Botany; but rather to sketch and photograph the wondrous scenes on the mighty Mackenzie, yet, like her father's daughter Miss Taylor could not let such an opportunity pass of adding her quota to our knowledge of the northern land which her father has done so much to bring before the world. The botanical results of her trip were submitted to the writer for identification and a complete set consisting of 170 species of remarkably well preserved specimens was presented to the Museum of the Geological Survey Department.

An examination of the specimens proved conclusively that the warm currents of air that are known to occur in the Peace River country pass down the Mackenzie and account for the occurrence of a flora north of the Arctic Circle that seems in no way different from that which is to be found 1,000 miles to the South. Northern exposures give true arctic species; but these evidently are not the prominent flora of the Mackenzie delta as they are almost wholly absent from the collection. Another feature of interest in this collection is the gathering of specimens in exactly the same localities where Sir John Richardson obtained them 70 years ago and the sight of them side by side with his record of their occurence shows how little we have added to the botanical knowledge of the far north in recent years.

Besides many interesting species that are well known to us, Miss Taylor brought specimens of two plants from Peel River in the Mackenzie delta which may eventually throw some light on the origin of the northern flora. One is a species of Birch which is evidently a good sized tree and which is either identical with a Siberian species (*Betula microphylla*) or is new to science. Ripe fruit of the species was procured and seed has been handed to Mr. Fletcher to be grown in the Botanic Garden of the Experimental Farm, and thus in time, I trust, we shall know exactly what it is. The other species is an Umbelliferous plant related to the genus Ligusticum which may also be new.

This collection is of much interest and demonstrates clearly what good scientific results may be obtained by an observant traveller with a little trouble if only there be a wish to make the most of such opportunities as may arise.—JOHN MACOUN, Ottawa.

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CONCHOLOGY.

LIMNÆA STAGNALIS.—A beautiful living albino of this species was found in Chilcott's Lake, Masham, in August. The animal did not appear to differ from those in the numerous other specimens of the same species which occurred in the same locality; the shell, however, was as white as a pearl and of beautiful lustre. Erosion of the epidermis and exposure to the sun tend to whiten the shells of all our snails; but the epidermis of this example is perfect. Its whiteness results no doubt from disease of those peculiar glands whose function it is, in the shell-bearing mullusca, to extract an infinite number of beautiful pigments and deposit them in that combination of variety and regularity at which all have marvelled who have ever observed a cabinet of shells, where

> "Not a shell
> "But shows some trace in freckle, streak or stain,
> "Of His unrivaled pencil."

HELIX DENTIFERA.—This rare shell was taken a few years ago on Mr. Craig's farm near Casselman. It appears to have reached at that point the north-eastern limit of its distribution in Canada. There is a record of its occurence in Muskoka, but it is probably erroneous. In the immediate vicinity *H. dentifera* has never been found. In the Province of Quebec, it has an extensive range from Montreal as far east at least as the Island of Orleans and southward to Knowlton, in the Eastern Townships, whence it extends into New Hampshire, Vermont and New York. Near the brow of the shaly cliffs of the Island of Orleans, opposite Montmorency Falls, seven fine specimens were taken in an hour in August, 1891. They do not differ from the Casselman shells except in being thinner. The occurence of *H. dentifera* at places so near to each other as Casselman and Montreal, indicates that the shell may be found at intervening points. If the Club would run an excursion to Alexandria next summer, the conchological branch would probably attend in a body.—F. R. Latchford.

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ZOOLOGY.

SALVELINUS OQUASSA in the Ottawa District.—A beautiful living specimen of what I take to be a male Oquassa or Blue backed Trout, sometimes called the "Rangeley Lake Trout", *Salvelinus Oquassa*, Girard (sp.) can now be seen living in one of the aquaria at the Fisheries Exhibition on O'Connor Street in this city. This specimen, which has been referred to me for identification, was recently obtained by Mr. Vernon C. Nicholson at Lac de Marbre, in the Township of Wakefield, Province of Quebec, who last year noticed the difference between it and *Salvelinus fontinalis*, Mitchell (sp.), the ordinary Brook Trout of the district. He killed at that time several specimens of *S. Oquassa* in the above named lake. In another lake quite close to Lac de Marbre the ordinary Brook Trout abounds; but so far as Mr. Nicholson observed the two species do not occur together.

The specimen has been identified with *S. Oquassa* from external characters only, and its hyoid bone has not been examined, but if correctly determined, the occurrence of this species in the Province of Quebec is of especial interest, as heretofore it has only been recorded from Maine.

According to Jordan & Gilbert, * the hyoid bone in *S. Oquassa* has a "narrow, median band of teeth," which, however, are "sometimes lost," but in the common Brook Trout (*Salvelinus fontinalis*) the hyoid teeth are wanting. The following is a copy of Jordan & Gilbert's specific description of *S. Oquassa* :

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* Synops. Fishes N. America. Smithson. Miscell. Coll., vol. xxiv (1883), p. 318.

"Body elongate, considerably compressed, less elevated than in the other species of this genus, the dorsal outline regularly but not strongly curved. Head quite small, the maxillary short and moderately broad, scarcely extending to the posterior margin of the eye. Eye large, 3½ in head. Jaws about equal. Scales small, those along the lateral line somewhat enlarged. Pectoral and ventral fins not elongate; opercles without concentric striæ. Coloration dark blue, the red spots small and round, much smaller than the pupil, usually confined to the sides of the body; sides with traces of dark bars; lower fins variegated, as in *S. fontinalis.* Head, 5; depth, 5. D. 10; A. 9. Lat. l. 230; gillrakers about 6 + 11. Length, 12 inches. Smallest and handsomest of our trout, as yet known only from the Rangeley Lakes in Western Maine."—J. F. WHITEAVES.

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EDITORIAL NOTES.

WINTER SOIREES.—The first meeting of the Winter Course will be held early in December in the Normal School Lecture Room when Dr. George M. Dawson, C.M.G., F.R.S., &c., will deliver his Presidential address. The full programme for the Course of Winter lectures will be given in our December issue.

CREATING A STIR.—A great coming event is the publication of a wonderful almanac to be called the *Star* Almanac, published by the Montreal *Star*, It is said to be a marvellous work, four hundred pages, with coloured maps.

TORONTO "SATURDAY NIGHT'S" XMAS NUMBER, 1892.—Another literary treat is promised in the Christmas number of *Saturday Night. The Newsdealer, Publisher and Stationer's Bulletin*, the Canadian correspondent of which has seen advance copies of all that is promised, says that "It will doubtless be the most beautiful publication ever attempted in America and compares more than favourably with *Figaro* and the most expensive Old Country Christmas numbers."

BOOK NOTICES.

CATALOGUE OF CANADIAN PLANTS. PART VI, MUSCI, pp. 295. By JOHN MACOUN, M.A., F.L.S, F.R.S.C., Montreal, 1892.

In the preceding parts, I. to V., of this very valuable work Prof. Macoun has enumerated the various species and varieties of flowering plants, ferns, and fern-allies, native and alien, to be found within the Dominion of Canada and Newfoundland, and has given very fully the geographical distribution of each so far as this is known. The total number of flowering plants, ferns and fern-allies therein recorded being 3,209 species with numerous varieties. Of these 2,340 are Exogens, 771 are Endogens and 98 are Acrogens, added to which is a list of 165 Hepaticæ or scale mosses. The part under review which treats of the Musci or real Mosses is a phenomenal work. one that has probably never been excelled. The commencement of this great undertaking more than a quarter of a century ago, must have been surrounded with difficulties that could only be overcome by great courage and determination. Still, the author has persevered and after 31 years of unremitting labour he is able to present to the scientific world a record of which he and his fellow countrymen have a right to feel proud. To go into minuter details of so voluminous a work would require more space than can be allowed, so that a mere summary can be given. In the present part, Prof. Macoun records 1,070 species and varieties as the total Moss Flora of Canada, so far as this is at present known, giving a much larger record for Canada alone than is given by Lesquereux and James in their valuable "Manual of the Mosses of North America," which included not only the United States, but also Canada; their record being 1,020 species and varieties. But of the 1,070 species and varieties given by Prof. Macoun, 400 are not recorded in "The Manual," so that the author has raised the Moss Flora of America from 1,020 to over 1,420 species and varieties. And what is even more remarkable is this, that of the 400 additional moss plants 200 are new to science,—have never before been recorded,—hence it may be said with truth that Professor Macoun's work has created an epoch in the Bryology of North America. But what stamps this work with even greater value, is this, that Prof. Macoun has not depended, for the determination of his plants, on his own unaided judgment, but has submitted them for confirmation to some of our greatest bryological specialists, such as Profs. Lesquereux and James, Mr. Coe. E. Austin, and Drs. Kindberg, Carl Mueller, Venturi and Warnstoff, thus making assurance more assured. Increased value is given to the work by the full and able descriptions of the new species, and by the many personal notes of the author on those little points of difference that indicate close observation and which are so very helpful to the student. The author is to be congratulated on the thoroughness of his work. The work he had set himself to do was expressed in the first sentence of the preface to Part I.: " The purpose of this work is to place in the hands of Canadian botanists, in a connected form, the knowledge so far obtained, of the extent and distribution of the Flora of Canada." This has been carried out even beyond the author's first expectation, and he has presented to the botanists, not only of Canada, but of the world, a work that will command their respect and admiration, a work that must form the basis of all future floras of Canada, and the author will be esteemed as one who did his work ably and well, carrying out to the fullest the Preacher's precept, "Whatsoever thy hand findeth to do, do it with thy might."

J. E. BAGNALL,
A. L. S.

A TEXT-BOOK OF AGRICULTURAL ENTOMOLOGY, by Eleanor A. Ormerod, F. R. Met. Soc., &c. Small 8vo, pp. 238. Second Edition, London, 1892.

We have much pleasure in announcing the publication, under the above title, of a new and much enlarged edition of Miss Ormerod's Guide to Methods of Insect Life and Means of Prevention of Insect Ravage. During the last decade, owing almost entirely to the efforts of our eminent and highly esteemed corresponding member, the authoress of this work, Economic Entomology has become recognized in England as an important branch of practical agriculture and is now one of the subjects of agricultural instruction, which is being brought prominently forward under the arrangements of the new County Councils. The above named treatise has been called forth by the demand for a reliable text-book, and it is well that the preparation of a work, the importance of which will year by year become more evident, should have been taken up by such able hands. The text-book is practically a new work and provides the English cultivator and agricultural student with a concise book of reference by means of which he can identify any injurious insect or its attack, which is likely to occur on his crops. We think that too high praise cannot be expressed for the manner Miss Ormerod has fulfilled her self-imposed task. The language is so simple and concise; and yet each detail is so scientifically accurate, that the danger of making mistakes in the identifications seems quite impossible. Miss Ormerod, from her long experience, perseverance, keen observation, and natural aptitude for this special work, has made herself the highest authority on Economic Entomology in Europe; in fact, she holds among the Entomologists of the old world, the same relative place as Prof. C. V. Riley on this continent. Miss Ormerod does not profess to be what is called a scientific entomologist, but we claim that she is scientific in the truest sense, in that she shows in all her writings a determination to have perfect accuracy before everything else; she spares no trouble to attain that end, and her one object is manifestly to discover as soon as possible the complete life-history of any pest she may have under consideration and the most efficient and practical means of checking its injuries to farmers or others.

CASTOROLOGIA, or the History and Traditions of the Canadian Beaver; by Horace T. Martin, F. Z. S., etc., Royal 8vo, pp. 238. Montreal 1892.

The above work has been received, and it certainly is what it professes on its title page to be, "an exhaustive monograph, popularly written." The author must have spent much time in the collection of the numerous facts which he now gives to the public in this most attractive work. It would be hard to find any subject connected with Beaver lore or with the natural history of the animal, which has been omitted. The illustrations, which are profuse and for the most part from the pencil of the author himself, are excellent. The printing and general make up of the book are very noticeable. One great defect, however, exists:—there is no Index. Other defects, to the editor's mind, are that, in accordance with a prevailing fashion, the paragraphs are too widely leaded, the leaves are not cut and the paper is left uneven at the edges. Although many approve of these latter features, the first certainly breaks the continuity of the subject, and the second makes it difficult to turn the leaves easily for reference.

The very important role that the trade in Beaver-skins has played in the history of Canada is carefully worked out as well as the uses of the Beaver in manufactures. Of greatest interest to the naturalist is of course the life-history of this animal, in which its habits and methods of constructing its wonderful huts, dams and canals, are fully described and the many fabulous statements of travellers and hunters are discussed. The difference between the European Beaver and the Canadian species, first noticed by Cuvier, is pointed out, and the name *Canadensis* for the North American species, which was given to it by Kuhl in 1820, is claimed to be the correct designation.

In treating of allied animals of the same order, we are pleased to notice that Mr. Martin uses the name Musk Beaver, for *Fiber Zibethicus*. instead of the more usual, but less accurate term Musk-rat.

The following titles of some of the chapters give some idea of the scope of this very interesting and instructive work:—Mythology and Folk-lore; The more important American Rodents; Life-history; Geographical Distribution; Engineering accomplishments; Importance in Trade and Commerce; Hunting the Beaver; The Beaver in Heraldry.

Under Experiments and Domestication, a full account is given of the Marquis of Bute's effort to establish a colony of Canadian Beavers near Rothesay in Scotland. The author paid a visit to the "enclosure" in July 1889 and made some interesting observations, which he records.

As appendices are given photo-copies of parts of original documents (1721-1726), Samuel Hearne's account of the Beaver, and a description by Dr. Riley of the remarkable beetle parasitic on the Beaver, *Platy psyllus castoris.*

We have much pleasure in recommending this book to our readers.

CLOTHES MOTHS.

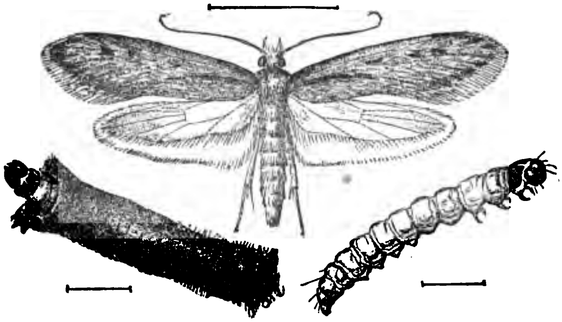
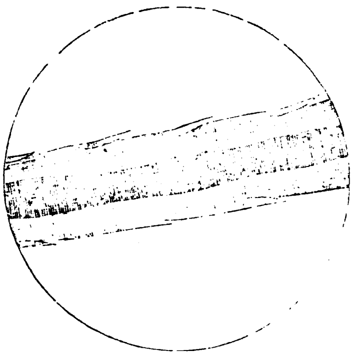


FIG. 1.—Clothes Moth, *Tinea pellionella, L.*

A most remarkable specimen, due to the work of insects, has been sent to the Editor by Miss Lucy C. Eaton, of Truro, Nova Scotia. This consists of a piece of cotton ticking, which had been used for a pillow case, and the inside of which has been so completely covered with fragments of feathers as to have the appearance of gray velvet or plush. Without examining it under the microscope, it seems difficult to believe that the beautifully even surface can have been produced in the way described, but this is undoubtedly the case. Miss Eaton writes that the pillow was made in the fall of 1889, and not opened till two years afterwards. It was filled with turkey feathers, which are very soft and downy at the base. Miss Eaton noticed that when this pillow was placed on beds, although no one made any remarks, she more often than not found it on the floor in the morning. After a time, suspecting nothing, she put it on her own bed, when the mystery was solved, for she says "I could not sleep for the noise like something crawling slowly back and forth." She turned it over and over, but it was no use, she was at last obliged to serve it as it had been served on so many previous occasions, and once more it was thrown to the floor. Some months after, upon opening the pillow, the whole inner surface was found to be entirely covered with a coating of velvety pile, and the feathers, some specimens of which were forwarded, were entirely stripped of down, which was cut into morsels almost as fine as dust. From the extent of the damage Miss Eaton expected to find an insect of the size of a grasshopper; but found instead only the empty cocoons of the caterpillars of the small Clothes Moth (*Tinea pellionella*, Linn.) shown admirably in the excellent cut (Fig. 1) which has been kindly lent by Dr. C. V. Riley, the U. S. Entomologist. The felting of the ticking was due to the barbed nature of the morsels of feather. The plumules of feathers and the down of many animals when highly magnified are found to be invested with minute barbs, all pointing the same way. The feathers were cut up by the caterpillars of the moths feeding upon them, and the minute barbed portions of the feathers by the movement and shaking of the pillow were brought in contact with the pillow case. These morsels, if short enough, had sufficient rigidity to work their way into the cotton cloth, and were at once fastened there by their own barbs. The value of these barbs in the making of felt is explained in a most interesting manner in Mr. Horace T. Martin's excellent work "Castorologia," where he describes the manufacture of felt from "beaver wool," for the shapes of hats, and shows the nature of the barbs or "staple" of this wool by the magnified illustration (Fig. 2), which he has been kind enough to lend us. In this illustration, a hair of beaver wool is shown magnified 250 diameters.



Beaver fur. Magnified 250 diameters.
From Martin's CASTOROLOGIA, p. 132.

The Clothes Moth *Tinea pellionella*, as well as the other two species of Clothes Moths found in this country, *Tinea tapetzella* with black and white wings, and *Tineola biselliella*, with pale, silvery, fawn-coloured wings, is an immigrant from the old world.

1. *Tinea pellionella*, Linn., in the perfect state, is a small, gray moth, with three or four black spots on the wings. These lie flat over the back. The caterpillar lives in a short, muff-shaped case, which it carries about with it. (Fig. 1).

2. *Tinea tapetzella*, Linn. The moth has the base of the wings black and the tips white or gray. The caterpillar lives always in a tube which it spins through and over the article it is destroying, working into it particles of the cloth or other material attacked.

3. *Tineola biselliella*, Hum. The moth is silvery fawn-coloured with the wings sloping when at rest, The caterpillars pins only a sligh tube or path of silk on its food or is frequently found uncovered When full grown it spins a close cocoon something like the case of No. 1, but rounder at the ends and less regular.

These all pass the winter as caterpillars without feeding and change to chrysalides and a little later to moths in the spring.

No article, however short, upon these troublesome insects would be complete without some suggestions as to the best means of preventing their injuries. The whole damage is done by the caterpillars and none by the perfect moths.

The habits are as follows: The moths which lay the eggs from which the caterpillars hatch, appear in spring and through the summer. These fly to any object composed of suitable food for their young to feed upon, and lay eggs which hatch into minute caterpillars; these feed till winter and then remain torpid through the winter changing to moths the following spring. When possible all articles of clothing liable to attack should be well shaken, brushed and put away in tightly closed paper parcels before the moths appear in spring. The caterpillars only feed on animal substances, therefore articles wrapped in paper, cotton or linen are safe. Clothes which are not packed away before the moths show themselves should be hung in a conspicuous place where they will not be forgotten so that they may be frequently shaken or brushed.

Carpets, furniture, or furs which have become infested may be sprinkled or saturated with benzine or gasoline which will destroy all insect life. Care must, of course, be taken not to have a light near when these inflammable substances are being used.

Putting camphor, naphthaline, pepper and cedar amongst clothes, have the effect of keeping the moths from laying their eggs upon them to a large extent, but they are not sure remedies.—J.F.

THE WINTER HOME OF THE BARREN GROUND CARIBOU.

By J. B. Tyrrell, M.A., F.G.S., F.G.S.A.

Among the few large animals still found in great numbers on this continent, the Barren-ground Caribou (*Rangifer Grœnlandicus*, *Linn.*) is probably the most interesting and important. It is the principal occupant of the great lonely wastes that extend southward from the shores of the Arctic Sea, not only in America but also in Europe and Asia. The Indians who people the northern part of Canada, including the Chipewyans, Yellow-knives and Dog-ribs, subsist very largely on its flesh, while its light warm skin with its thick covering of light grey hair furnishes them with beds and winter clothing, and the tanned hides, sewed with the sinews from the back, supply them with footgear and comfortable tents. In fact all their necessities, except their ammunition, tea and tobacco and a small amount of summer clothing, are supplied by the Caribou.

In size the Barren ground Caribou is much smaller than the woodland species, an adult female shot by the writer near Lake Athabasca being about as large as the common Virginia deer of this vicinity, and weighing about one hundred and fifty pounds; while an adult male of the woodland species, obtained in the rocky country east of Lake Winnipeg, the head of which is now in the Museum of the Geological Survey, weighed between three and four hundred pounds.

The horns are very large and irregular, very few of them being alike, and all being apparently unsuited to travel through the thick woods. The males are said to shed their horns in November, while the females retain theirs throughout the winter and shed them early in the following spring.

Their winter coat of long hair is shed early in July, and by August or the beginning of September the hide is in excellent condition, and the hair is soft and not too long, so that at this season the Indians endeavour to kill a sufficient number to furnish themselves with clothing for the winter. Later in the year the hair becomes harder and more brittle, and the hide is said to be riddled with holes made by the larvæ of a bot fly.

In summer these deer live on the great rocky wilderness that extends from a short distance north of Athabasca and Reindeer Lakes, between Great Slave Lake and Hudson's Bay, to the Arctic Ocean. In the autumn they collect together in large bands and move southwards into the wooded country where they spend the winter, leaving again for the Barrens in the early spring.

During the present year the writer spent the summer in one of their favourite wintering grounds in the hitherto unexplored region north of Churchill River and south-east of Lake Athabasca. Almost all of the deer were at the time away to the north, but a few stragglers had remained behind.

Our party entered the country by ascending the Caribou River, a stream about as large as the Rideau, flowing into Churchill River 225 miles north of Battleford. On the first of July it was found to be at its extreme high water level. Its banks were overhung with willows, and its bed was quicksand, so that we could neither track nor pole, but were obliged to ascend it with the paddle against a heavy and constant current. The river flows in a wide valley, with high granite ridges at some distance back on both sides.

As the river is ascended, poplar, white spruce, and all underbrush gradually disappear, and the country becomes generally wooded with Banksian Pine, with Black Spruce in the wet places, and great stony tracts devoid of timber of any kind. We have now reached the winter home of the Caribou which in this region stretches northward from about Lat 56° 45'. It consists of long almost bare hills of Archæan rocks, separated by wide valleys, the bottoms of which are filled with sand and ridges of boulders. In these valleys lie many small lakes, on the shore of one of which, near the head of Caribou River, the Hudson's Bay Company established a small trading post last autumn, and traded with the Indians throughout the winter, but in spite of the fact that meat is abundant the Indians are not going back there this winter and the post has been abandoned.

The Indians report that the deer collect on the frozen surface of these lakes during the day in immense herds, and are readily killed as long as the desire remains to shoot them, or till the whole herd is exterminated. My informants stated that last winter the hunters killed from one to three hundred deer apiece. Besides deer a fairly succesfu hunt of fur-bearing animals was also made.

This region, so full of magnificent game every winter, is very easily accessible, and a party of hunters could spend a few weeks among the deer without the least discomfort and at the same time have glorious sport. The railroad runs to Prince Albert and from there the winter home of the Caribou is only 250 miles in a straight line, a distance that could readily be covered in a week with dogs, and three forts of the Hudson's Bay Company would furnish stopping places on the route—Isle à la Crosse, the most northerly of the three, is the home of Mr. H. G. Moberly, the officer in charge of the whole district, and a keener sportsman, a pleasanter host, and a more genial companion cannot be found in the west.

Farther to the north, at Fond du Lac, near the east end of Lake Athabasca, a venerable old half-breed named José Mercredi, a native of Red River, has kept one of the Trading Posts of the Hudson's Bay Company for the past forty-seven years, supplying a band of about 80 Chipewyans with ammunition, tea, tobacco and the few other products of civilization which they require, receiving in return a large amount of Caribou meat, in the form of dried meat and pemican, which is sent to assist in supporting the people at Fort Chipewyan and other less favoured posts on Athabasca and Slave Rivers. Fond du Lac itself is situated at a narrow part of the lake on one of the main paths used by the Caribou southward, and Mercredi informed me that for a week or more in the autumn the deer can be killed in great numbers from the door of the Post as they pass through the yard and among the houses. Several of the men were said to have killed as many as four hundred during the past year.

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OVIS CANADENSIS DALLI, *Nelson.*

By R. G. McConnell.

While crossing the Rocky Mountains, in 1888, from Fort Macpherson on Peel River to Lapierre House on the Porcupine, Lat. 67° 40′ N., he writer was fortunate enough to come across the interesting variety of the Mountain Sheep known as *Ovis Canadensis Dalli*, Nelson. The specimen seen was shot on a steep rocky slope near the summit of the range, and in rolling down, the skin and horns were injured so severely as to render them useless as specimens. This variety of the Mountain Sheep differs from the type of the species in its smaller size, in its uniform white colour, and in the slenderer build of the horns, but all these characters appear to be variable. The first information in regard to this animal is given in a short article by Mr E. W. Nelson in the proceedings of the U. S. National Museum, Vol. VII., p. 12, 1884. (See also Report upon Natural History collections made in Alaska between the years 1877 and 1881 by Edward W. Nelson, p. 282, issued in connection with the Signal Service U. S Army, 1887. Mr. Nelson in this article describes the colour as a dingy white and states that the hairs are tipped with a speck of rusty colour. Lieut. H. T. Allen, U.S.A., on the other hand in a letter in "Science," Vol. VII., p. 57, 1886, states that the sheep seen by him on the head waters of Copper River, Alaska, were by no means dingy, but were, in fact nearly as white as their surroundings of snow. The latter statement agrees with my own observation, as the animal shot by my Indians was almost pure white. Another variation in colour was reported to me by some miners on the Yukon, who described some sheep shot by them on the upper part of this river as having a brown patch on both sides behind the fore shoulders, and referred to them as the "Saddle-backed Sheep." The latter probably mark a stage in a progressive change in coloration from the nearly uniform dull-brown of the normal species to the pure white of the northern variety.

The diminution in size of the northern sheep is even more remarkable than the change in coloration. Those shot in the southern part of the Canadian Rockies range in weight up to three hundred pounds, while the sheep brought into Fort Macpherson from the mountains west of Red River, according to Mr. Hodgson the officer in charge of that post, seldom exceed a hundred pounds in weight. Some of the specimens seen by Lieut. Allen, U.S.A., on the high snowy mountains at the head of Copper River, Alaska, are described by him as being as large as the ordinary Big-horn, while others met with only a short distance away and at a lower elevation were very much smaller. It would appear from this that the decrease in size towards the north is not constant and cannot be altogether dependent on climatic conditions.

The light-coloured variety of the Mountain Sheep ranges along the Rocky Mountains from the Arctic Ocean southward, so I am informed, to the great break in the chain through which the Liard flows (Lat. 59° 30′ N.). It is also found on all the higher mountain ranges of Alaska and the adjacent part of the North-Western Territory of Canada. It is not found east of the Rocky Mountains nor does it occur, according to the information I obtained from fur traders and others, in the continuation of the Rocky Mountains south of the Liard.

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NATURAL SCIENCE IN ILLINOIS.

The opening of the Natural History Hall of the University of Illinois, at Champaign, Ill, on 16th November last, shows the high appreciation of Economic Science in the Western States, where the "making of money" is supposed to be the sole consideration of all classes of society.

The building and equipment of such an Institution as is described below, proves that if even the most abstruse scientific investigations can only be shown to be of public utility, the necessary money will bo forthcoming for their prosecution. This Natural History Hall may be considered to be a monument to Prof. S. A. Forbes, the eminent State Entomologist of Illinois, to whose unceasing and well directed efforts its completion is so largely due. Prof. Forbes is too well known as an accomplished investigator in various fields of Natural History, to make a detailed notice of his work necessary here. He was appointed to his present position in 1882, and, in addition to his official reports as State Entomologist, has issued many valuable papers in scientific publications. His studies of the food habits of birds and fishes are of the highest merit. He is now engaged in the preparation of the second volume of the Ornithology of Illinois. Part I, already issued, is a Descriptive Catalogue (520 pages, 33 plates), by Dr. Robert Ridgway; Part II, Economic Ornithology, will be the work of Prof. Forbes. These volumes are the first of a series on the Zoology and Cryptogamic Botany of the State of Illinois, authorized and provided for by the Legislature in 1885, and will be prepared under the direction of the Illinois State Laboratory of Natural History.

In the autumn of 1890, the Editor had an opportunity of visiting Champaign, and was kindly shown over the entomological and botanical laboratories by Professors Forbes and Burrill, and is therefore able to form some idea of the excellent methods of work adopted at the University of Illinois, in the branches of research over which these gentlemen preside.

Having no doubt that some account of this splendid addition to the facilities for the prosecution of good natural history work in North America would be of interest to our readers, the editor wrote to Prof. Forbes, asking him to give some data concerning the Institution itself, and the dedicatory ceremonies. In reply to this request the following letter was received :

CHAMPAIGN, ILLINOIS, U.S.A., November 18th, 1892.

Your kind note and the copy of the "OTTAWA NATURALIST" were duly received and especially appreciated. I am pleased that you thought of making some mention of our new building, and take pleasure in giving you such particulars as it seems to me you are most likely to want to use.

The building was put up at an expense of $70,000, exclusive of furnishing, appropriated by the State Legislature. It is 134 feet in length by 94 in width, and three stories in height above the basement. There is a spacious, well-lighted central hall, around which on all sides are situated laboratories, lecture rooms, closets, store rooms, and dark rooms, a full series for each department.

As an example of the arrangement and equipment of this building a general description may be given of the provision for zoology. The students' laboratories in this department are three in number on the first floor—for elementary, advanced, and postgraduate work respectively. In the first, table room is given for thirty students: in the second, for sixteen ; and in the last, for ten. Adjoining the first is the private laboratory of the Assistant in Zoology, and next this the lecture room. Directly over the Assistant's laboratory is that of the Professor of Zoology, and over the postgraduate laboratory is his private office. On this second floor are also the rooms of the State Laboratory of Natural History, consisting of an assistant's laboratory 21 x 36 feet, a collection room of the same size, a library 23 x 32, and a room for the artist of the establishment. In the basement of the building is a very large store room for the department, and an animal room to be fitted with aquaria, animal cages, and the like.

The zoological laboratories are furnished with an abundance of microscopes, and with microscopic apparatus, including first-class microtomes, an incubator, and an imbedding apparatus. A full equipment for field work in the various departments is at the service of the students, and the library and collections of the State Entomologist and the State Laboratory of Natural History are also made accessible to them under suitable restrictions.

On the third floor are the zoological collection rooms, containing the material required to illustrate the work of the department.

Intimately associated with the zoological deparment of the University, and practically merged with it since 1884, is the work of the Illinois State Laboratory of Natural History and that of the office of the State Entomologist of Illinois; the former consisting essentially of a systematic and thorough-going investigation of the zoology and cryptogamic botany of the State, the results of which are in process of publication by the legislature, and the latter of entomological investigations whose main end is economic, but whose product is largely scientific and educational Both these departments of work, although supported by appropriations independent of those of the University, are directed by the head of the zoological department of University instruction, and provided with quarters and facilities in Natural History Hall.

Our dedicatory exercises were completely successful. Dr Jordan did us the very great kindness to come all the way from California for the express purpose of deliverieg the principal address, and Professors Trelease and Winchell also contributed very interesting papers. There was a considerable attendance of scientific men of this and adjoining States, and others would have been here had we been able to announce our programme earlier. The dedicatory exercises proper were followed in the evening by a lecture by Dr. Jordan on "Agassiz and his Influence," and a Faculty reception to the invited guests.

The addresses and some accompanying papers will be published as soon as practicable, for general distribution, in a small illustrated book.

Sincerely yours,

S. A. FORBES.

The following is a list of some of the papers read on the above occasion :—

"Development of the Natural History Departments"—Prof. T. J. Burrill.

"Science and the American College"—Dr. D. S. Jordan.

"The Laboratory as a necessary part of the College equipment"—Prof. Wm. Trelease.

"The methods of Geology"—Prof. N. H. Winchell.

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BOOK NOTICES.

1. GRASSES OF THE PACIFIC SLOPE, including Alaska and the adjacent Islands.

Part I. By DR. GEORGE VASEY.

The above volume, consisting of 52 exquisite plates, has just been issued as Bulletin 13 of the United States Division of Botany. In the introduction, Dr. Vasey says: "The grasses which are known to grow on the Pacific slope of the United States, including Alaska, number not far from 200 species. These are all specifically distinct from the grasses growing east of the Mississippi River, and also mainly distinct from the grasses of the plains and of the desert, except in that part of California which partakes of the desert flora. A considerable number of the grasses of the mountain regions of California, Oregon and Washington reappear in the mountains of Idaho, Montana, and the interior of the Rockies." In this Bulletin are figured for the first time, and described, several grasses conspicuous in size and apparent utility. This fact gives the work great value, not only to botanists, but also to the large number in the west, now interested in the raising of domestic animals.

It is of special value tc Canadian botanists, from the comparatively large number of rare and little known species figured, which are mentioned in Professor Macoun’s Catalogue; but which very few besides the Macoun’s, father and son, have ever seen.

The following is a list of the species mentioned in Prof. Macoun’s Catalogue which are figured in the present work :—

Agrostis æquivalvis, *Trin.*	Macoun’s Cat.	No. 2778	(Deyeuxia.)
“ humilis, *Vasey*	“	“ 3204	
Alopecurus alpinus, *Smith*	“	“ 2729	
“ geniculatus, *L.* *var.* robustus, *Vasey*	“	“ 2730	
“ Howellii, *Vasey*	“	under 2730	
“ Macounii, *Vasey*	“	No. 2731	
“ saccatus, *Vasey*	“	under 2730	
Calamagrostis Aleutica, *Trin.*	“	No. 2779	(“)
“ crassiglumis, *Thurb.*	“	“ 2783	(“)
“ deschampsioides, *Trin.*	“	“ 2784	(“)
“ purpurascens, *R. Br.*	“	“ 2791	(“)
Deschampsia cæspitosa, *Beauv.* *var.* arctica, *Vasey*	“	“ 2804	
Stipa occidentalis, *Bol.*	“	under 2738	
Trisetum canescens, *Buckley*	“	No. 2809	
“ cernuum, *Trin.*	“	“ 2810	

The descriptions of the species are stated to be almost wholly the work of Assistant Botanist, Prof. L. H. Dewey, and the beautiful figures are drawn chiefly by Messrs. T. Holm, W. R. Scholl and F. Muller.—J. F.

2. The Portland Catalogue of Maine Plants.

Under the auspices of the Portland Society of Natural History, Prof. Geo. L. Goodale, and the late Rev. Joseph Blake, published in 1868 the first edition of a “Catalogue of Maine Plants.” The second edition, just out, has been prepared by Mr. Merritt Lyndon Fernald, of Cambridge, Mass., and contains additions to the ‘old list,’ besides the results of a careful examination of the herbaria of some twenty botanists of Maine, to whose collections the author had access. This new catalogue is intended to be an introduction to a much more annotated list of plants, which, it is hoped, may be published within a few years. The plants of Maine, and those of the Maritime Provinces and adjoining portions of the Province of Quebec, are very similar, and a careful comparison between the records obtained in these sections of North Eastern America, will soon reveal the vast amount of work—good work—that has been and is being done; also of the geographical distribution of certain forms in various conditions, such as these Atlantic provinces afford.

The Portland Society of Natural History deserves commendation for the neat and careful way in which the Catalogue has been published.

H. M. AMI.

ORNITHOLOGY.

EDITED BY A. G. KINGSTON.

A fine specimen of the White-headed Eagle (*Haliæetus leucocephalus*) was shot by Mr. Edward White about the middle of November in a marsh near Rockland, about twenty miles east of the city. It was a young male, and measured 6 feet 9 inches across the extended wings. This bird is becoming exceedingly rare in the settled parts of Canada.

A curious instance of aberration from the usual nesting habit in the Chimney Swift (*Chætura pelagica*) came under the writer's observation in October last at Aylmer, Elgin Co., Ont. Instead of the seclusion of a hollow tree or disused chimney, the birds had chosen in this case to establish their home in a small outbuilding near the railway station. Despite the fact that persons were frequently passing through the building, the little cup of twigs had been glued against the wall about five feet from the floor. The marks of attachment and a few broken twigs still adhered to the wall when found, but the greater part of the nest had been torn down and laid upon a shelf close by.—A. G. K.

GEOLOGICAL SOCIETY OF AMERICA.

In response to an invitation from the ROYAL SOCIETY OF CANADA and the LOGAN CLUB, the Fifth Annual Meeting of the Geological

Society of America will this year be held in the City of Ottawa, beginning on Wednesday, December 28th, and lasting for three days.

Through the kindness of Dr. John G. Bourinot, C.M.G., the President of the Royal Society of Canada, the general meetings will be held in the Committee Rooms of the House of Commons. Addresses of welcome will be presented to the visitors by His Excellency the Governor General of Canada, and by the President of the Royal Society. It is also expected that a Popular Lecture, illustrated by lime light, will be given on the evening of the first day, and for this purpose Dr. MacCabe has kindly placed at the disposal of the Society, the large new Lecture Hall of the Normal School.

It is understood that all the meetings will be open to the public, aud there is no doubt that many valuable and interesting papers will be submitted.

Prof. G. K Gilbert, of the Geological Survey, Washington, is President of the Geological Society of America, and Prof. H. L. Fairchild, of Rochester, N.Y., is Secretary, both of whom will be present, and there are in Ottawa no less than 16 members of the staff of the Geological Survey Department, who are also members of the Society.

The programme is not yet completed, but the titles of several excellent papers have already been sent in, and doubtless many more will yet be received.

The annual Dinner of the Society will be held, conjointly with that of the Logan Club, on the evening of December 29th, at the Russell House, which will be the headquarters of the Society during their visit.

Among other papers to be read, the following are by Ottawa members :—

"The Coals and Petroleums of the Crow's Nest Pass"....Dr. Selwyn.
"The Devonian of Manitoba and the N. W. Territories"
Mr. J. F. Whiteaves.
"The Laurentian of the Ottawa District" ....Dr. R. W. Ells.
"Glacial Phenomena of the Athabasca District"....Mr. J. B. Tyrrell.

"The Archæan of the Sudbury District"... ...... Mr. A. E. Barlow.
"Cambrian Fossils from the Rockies and Selkirks" .. Dr. H. M. Ami.
"On the Relation of the Potsdam and Calciferous.... Dr. H. M. Ami.
"Natural Gas and Petroleum in Ontario" .... Mr. H. P. Brumell.
"Glacial Phenomena of the North East Territories"... Mr. A. P. Low.
"Notes on the Geology of the Gold Range"........ Mr. J. MacEvoy.
"Notes on the Glacial Geology of the Bay of Fundy". Mr. R. Chalmers.
"Notes on the Geology of Middleton Island, Alaska"
Dr. George M. Dawson.
"Glacial Pot-holes in Canada" .... Dr. Robt. Bell.
"Phosphate bearing Rocks of Quebec" .... E. D. Ingall.
"The Archæan Rocks west of Lake Superior".. Mr. W. H. C. Smith.

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EVENING LECTURES.

The first meeting of the Course of Thursday evening Lectures will take place on Thursday evening, Dec 15th, at 8 o'clock p.m., in the Lecture Room of the Normal School, which has been again placed at the disposal of the Club, through the kindness of Dr. J. A. MacCabe, the Principal.

It will be seen by the programme submitted herewith, that the subjects to be presented are of particular interest.

The usual course of Monday Afternoon Popular Lectures will not be given this season, owing to the large number of similar classes and lectures, which, for the present, render the course unnecessary. Owing to the unavoidable absence of the President, Dr. George M. Dawson, who has been summoned to England in connection with the Behring Sea arbitration, the inaugural address will be delivered by the 1st Vice-President, Mr. Frank T. Shutt.

As in the past, all of the soirées will be held in the Lecture Room of the Normal School, and will begin punctually at 8 p.m. They will last about an hour and a quarter. The Council is anxious to have it made known as widely as possible that admission to all these instructive lectures is FREE. Anyone wishing to attend may always be sure of a hearty welcome.

PROGRAMME

1892—OTTAWA FIELD-NATURALISTS' CLUB—1893.

EVENING LECTURES, 8 P.M.

1892.

Dec. 15—Address of Welcome...........Dr. J. A. MacCabe, M.A.

Inaugural Address: "The Air of our Houses"—
Mr. F. T. Shutt, M.A, F.I.C., F.C.S.

1893.

Jan. 5 —"The Fauna and the Flora of the Selkirk Summits"—
Prof. John Macoun, M.A., F.L.S., F.R.S.C.

"The Mineral Waters of Canada"..Mr. H. Peareth Brumell.

Report of the Botanical Branch.

Jan. 19—"Food in Health and Disease"........Dr. L. C. Prévost.

Reports of the Entomological and Ornithological branches.

Feb. 2—"Narrative of a Journey in 1890 from Great Slave Lake to Beechy Lake, on the Great Fish River." From the Journal of Mr. James McKinley, officer in charge at Fort Resolution, H. B. Co.....Mr. D. B. Dowling, B.A. Sc.

"The Chemistry of Soils".......Mr. A. Lehmann, B.S.A.

Report of the Conchological Branch.

Feb. 16—"The Development of Varieties, and the Multiplication of Individuals in Horticulture"........Mr. John Craig.

"Notes on Rainy Lake District"..Mr. W. H. C. Smith, C.E.

Report of the Geological Branch.

Mch. 2—"The Progress of Metallurgy in Canada"—
Mr. N. J. Giroux, C.E., F.G.S.A.

"My Aquarium"....................Mr. H. B. Small.

Report of the Zoological Branch.

EVENING LECTURES, 1892-93.

First meeting held Dec. 15th, 1892. Mr. Frank T. Shutt, M.A., Vice-President, in the Chair.

There were two papers on the programme: An Address of Welcome by Dr. MacCabe, Principal of the Normal School, and the Inaugural Address, by Mr. Shutt.

The chairman, in introducing Dr. MacCabe, said: I have great pleasure in announcing that we have with us this evening, the gentleman through whose kindly offices the Field-Naturalists' Club has the gratuitous use of this Hall in which to hold their winter meetings,—Dr. MacCabe, Principal ot the Normal School.

We owe him a great debt of gratitude for this privilege; for looked at merely from a monetary standpoint, this arrangement effects a considerable saving in the Club's funds. But this, I take it, is by no means the only, nor indeed the greatest, advantage in our meeting here. By so doing, the work of the Club is brought very prominently and forcibly before that large class of workers—the Normal School students—men and women who are here for a time, for the purpose of fitting themselves for the grand profession of teaching. May we not hope, nay rather may we not expect, that the attendance here, and on our field days, may have awakened in many, a love and an interest for Natural Science, in the animals, the plants and the rocks that are about us; and may we not further expect that they, in turn, will impart to their pupils the knowledge here gained—that love and interest in the things of nature that we have been the means of instilling. Thus it is, that through them the work and influence of the Club may be extended into fields otherwise impossible for us to occupy.

Upon the invitation ot the Council, Dr. MacCabe has kindly consented to address a few words of welcome to the Club.

Dr. MacCabe, on coming forward, was warmly greeted. The following is an abstract of his address, which was listened to with great attention and pleasure. The points introduced were apt and strongly put. Dr. MacCabe is a dignified and easy speaker, and his distinct enunciation made it easy for everyone to hear what he said:

Dr. MacCabe said he had much pleasure in renewing the welcome he extended to the Club and its friends on the occasion of its first meeting in the Normal School. The Club is welcome for two reasons:—First, because its work is part and parcel of the great work of aducation, to which this institution is dedicated; secondly, because of the fact that many members of the staffs of the Normal and Model Schools, are active members of the Club; and the Normal School students—to their profit and pleasure—are made, welcome to the lectures and excursions.

The Ottawa Field-Naturalists' Club is one of those working bodies of Scientists, who in the language of Shakespeare, find "tongues in trees, books in the running brooks, sermons in stones, and good in everything."

The study of natural science when prosecuted aright, cannot fail to be productive of immense benefit during all the future career of the student. It communicates knowledge of great practical value in almost every sphere and pursuit of life. It has been well said:—"It will not be difficult to show that almost every new and valuable invention, from the spinning-jenny to the telephone, which has increased the control of man over nature, economised his time, or added to his comfort, is the product of scientific knowledge, and often of experiments and researches which had, at first, no merely utilitarian purpose, but were undertaken with the sole and simple object of discovering the secrets of nature, and of revealing truth. And there is not a single lesson by means of which you can convey to a learner a strong interest in any one department of physical science, which may not develop itself, as it works and germinates in his mind, into results and discoveries of unexpected value, and add enormously to the resources and to the enjoyments of mankind.

And, if the study of Natural Science is of inconceivable value in all the practical pursuits of life, it is equally advantageous, in the disciplining of mind. Prof. Huxley, in a lecture on scientific education, puts the matter clearly, thus:—"If scientific training is to yield its most eminent results, it must be practical—that is to say, in explaining to a learner the general phenomena of nature you must, as far as possible, give reality to your teaching, by object lessons. In teaching him botany, he must handle the plants, and dissect the flowers for himself; in teaching him physics or chemistry, you must not be solicitous to fill him with information but you must be careful that what he learns, he knows of his own knowledge. Do not be satisfied with telling him that a magnet attracts iron; let him feel for himself the pull of the one upon the other. In all other branches of Natural Science, pursue this discipline carefully and conscientiously, and you may be sure that, however scanty may be the measure of the information which you have poured into the learner's mind, you have created an intellectual habit of priceless value in practical life. If you are setting to work to teach science, you must teach it through his eyes, his hands and his other senses."

The work of the Field-Naturalists' Club is, thus, educational in the true sense of the term. The powers of observation are cultivated through the analytical process to which each object is subjected; the tracing of relations, generalization, classification, the formation of principles and laws—all these processes which are among the highest of our mental activities are carried on in this practical work. And the mind will be led from the world of visibilities to that of invisibilities, from matter to mind, from finite to infinite, from Nature to Nature's God.

Dr. MacCabe wished the Club a very successful winter's course of lectures, and at the close of his most interesting address, which was loudly applauded, Mr. Shutt spoke as follows:

LADIES AND GENTLEMEN,

I am sure you are all of one mind with me when I express very sincere regret at the absence of our President to-night. For some months past, not only the members of the Club, but their friends also, have been anticipating the pleasure of listening to his Inaugural Address this evening—a pleasure which, I trust, is not lost but only postponed.

I counted the Club especially fortunate, when at our last annual meeting we prevailed upon Dr. Geo. M. Dawson to accept the Presidency of our Society. We were indeed, fortunate, in securing as our Chief Officer, a man of such high scientific standing; of such eminent ability; of such deep and thorough culture. A man so widely read and so widely travelled, and withal, so genial a gentleman as Dr. Dawson. As most of us are aware, the distinguished honour was conferred upon him some time ago, of being appointed one of the Commissioners in the Behring Sea Arbitration, now pending between us and the United States. It was only three weeks ago, and after he himself had fixed upon this date on which to deliver his opening address, that he informed us that he was suddenly re-called to England in connection with his duties as Commissioner, and that consequently he would be unable to be with us this evening.

I do not pretend to fill his place. I merely, by reason of my office, and at the urgent request of the Council, take precedence on the programme.

Before entering upon the subject of my address, however, you will naturally expect me to say something regarding the growth, the welfare and the present standing of the Club. I propose, therefore, to bring before you very briefly, some of the more important facts and features in the Club's more immediate history. Such information should be of interest both to us, who are members, and to those who are with us for the first time to-night. It is the wish that every member should be a real, active, live member, doing *something* for his or her own educational good, and the furtherance of the interests of us all. Working members ought to know—must know—what the Club is doing and how it prospers, if the work is to be successful.

THE CLUB.

The Club is not composed, as some might imagine, of scientists. We make no such claim. The Club is made up of those who have some love for nature, in one or other of her phases; of those who are wishful to learn something more than they already know regarding animals and plants, and the "solid ground of nature;" of those who, thus learning, are willing to share with and impart to others such fragments of knowledge as they have been fortunate in adding to their store. As Dr. MacCabe rightly said, we are first and foremost, an educational society. Opportunities to learn and investigate are offered to our members, in winter and summer ; let us see to it that we take advantage of them.

We have also another feature in our club life. I have been pleased to notice that we are a social Club, and to remark that there exists between a large number of our members a great and enduring friendship. It is certainly worth recording that there is this feeling of fraternity among those banded together to study nature.

MEMBERSHIP.

Our membership roll now stands at 275, having gained 26 new members during the past year. This, I think, is a very creditable record. The prospects are that we shall still further increase in the near future, as there are unmistakable signs of increased vitality and activity. With much regret I announce the loss by death of four members. Of these, I might mention particularly, the Abbé Provencher, the well known entomologist of Quebec, and Mr. W. P. Lett, our respected citizen, who for so many years contributed towards our winter programmes, papers which were always listened to with great interest.

EXCURSIONS.

I must now refer briefly to our Excursions, which have become such a noted feature of our summer life. We have had three general excursions this year, two of which were to explore the enchanting district lately opened up by the Gatineau River R.R. The natural scenery of the Gatineau Valley, bold and romantic, has been enjoyed by all who accompanied us, Nearly five hundred took advantage of these opportunities to "naturalize," and the unanimous verdict was that these outings were a great success. The third general excursion was held to Casselman, on the Canada Atlantic Railway, but owing to the weather being unpropitious. our attendance was small. The Saturday afternoon sub-excursions to points in the immediate neighborhood continued throughout the summer season.

JOURNAL.

During the past year, the OTTAWA NATURALIST appeared regularly and promptly, month by month. In it have been published many papers of more than passing interest and merit. The volume is one that reflects great credit upon the Club and its editor. For the arduous task of editing. we owe our heartiest thanks to Mr. Fletcher, "the father of the Club," who has spared no pains in this, his labour of love, to produce the society journal of which we are deservedly proud.

PROGRAMME,

The programme of the ensuing year is before you. Your Council have been at no little pains to prepare it. I believe it is one worthy of the Club, and I am sure it is one sufficiently varied to prove interesting to all. Our speakers are well known men in science, and they have selected subjects upon which they can speak as those in authority. I would earnestly invite such an attendance at our meetings as will show those who are thus working for us that we appreciate their efforts. I can confidently assure you that a regular attendance will not only give encouragement to those who address us, but also embue the listener, with that interest which results in benefit to themselves, and in the acquirement of much useful knowledge.

In conclusion, allow me to offer you four short rules for the coming year:

1. Attend the meetings regularly.
2, Read the Journal.
3, Go to the Excursions.
4. Pay your membership fee.

These are simple and easy to remember, and if faithfully carried out will make the Club still more successful than it has been in the past.

Mr. Shutt's lecture on Ventilation, entitled "The Air of our Houses," which here followed, will be printed in a future number.

Ed. O. N.

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A GREAT ALMAMAC.

The *Star* Almanac of Montreal is just out. It is a splendid thing. Everybody should have it, if they can possibly get it. It is being sent abroad in large numbers.

REPORT OF THE ENTOMOLOGICAL BRANCH FOR THE YEAR 1891.

(*Read February 25th, 1892*).

To the Council of the Ottawa Field-Naturalists' Club.

GENTLEMEN,—The leaders appointed in the section of Entomology have to report that they were not able to devote to their allotted duties, as much time as in former years. The prolongation of the session of Parliament during the collecting season, absence from the city, and other causes made it impossible for them to do as much work as they looked forward to accomplishing.

During the early part of the season very good collections of Hymenoptera were made, including about seventy-five kinds of Sawflies, of which two or three are undescribed species. An interesting outbreak of an imported sawfly was that of *Fenusa varipes*, St. Farg. (= *melanopoda*, Cam.) upon European alders at the Experimental Farm. This insect has become a serious pest and produces two broods during the season; the larvæ mining between the upper and lower surfaces of the leaves, and giving the foliage a very blotched and unsightly appearance. The imported Larch Sawfly (*Nematus Erichsonii*, Hartig.) still commits serious injury to the tamaracs (*Larix Americana*), in the neighbourhood, and the trees over many acres of swamp have already been killed.

A very interesting lot of small Hemiptera, chiefly homoptera, was also collected, which is now in the hands of Mr. Van Duzee for determination, and he writes that the lot contains some choice species. This district seems to yield a large variety of hemiptera, and the list of species already known is quite extensive, although no member has given them the special attention which they deserve.

The collections in Coleoptera were inconsiderable, and added little to our knowledge of this order, although many of the families still require special attention, and a systematic search should be made for species which in all probability occur here, but which have so far been overlooked.

In Lepidoptera the season was particularly unproductive, although as usual a few rare species rewarded the persistent collector. An expedition to Chelsea in search of *Thecla Niphon* only resulted in the capture of a single specimen, although all the circumstances seemed favourable; the weather was warm and clear and the meadow where it was taken in abundance in 1880 was copiously decked in every direction with the flowers of *Antennaria plantaginifolia*, its favourite plant. Early in the spring the Canker Worm (*Anisopteryx pometaria*) appeared in destructive numbers in some of the apple orchards near the city and also greatly defoliated basswoods, ashes, etc., in the neighbouring country. The Eye-spotted Bud-moth, another pest of the apple, was also exceedingly troublesome, destroying the forming bunches of blossoms, and also boring down into the heart of the fruit spurs. Two other small moths belonging to the *Tortricidæ* also beset the apple trees to a serious degree. These were *Cacæsia rosaceana*, a leaf roller which feeds on various plants besides the apple, and *Lophoderus quadrifasciana*, Fern., a small apple-leaf roller. Experiments were tried for controlling all of these, and it was found that spraying with a weak mixture of Paris Green was the most successful treatment. Locally the Black Army Worm, *Noctua fennica*, appeared in destructive numbers and committed serious injury to crops, particularly peas and clover. A fine specimen of the large and rare moth *Erebus odora* was taken by Mr. Martin Griffin, jr., and presented to the Museum of the Geological Survey. This moth has upon a few occasions been taken in Canada, but it belongs to the West Indian fauna, and it is supposed that the specimens taken in Canada have flown here from the Southern States or the West Indies. *Acronycta funeralis*, a rare and very pretty species, was bred from white birch. The caterpillar is blackish-green, and is marked on each segment along the back with an orange blotch, which bears long flattened hairs of a quill-like consistency. The caterpillar was taken almost full grown in June, and the moth emerged in August.

W. H. HARRINGTON. }
JAMES FLETCHER. } *Leaders.*
T. J. MACLAUGHLIN. }

LIST OF COLEOPTERA.

COLLECTED IN 1883-84 BY MR. T. C. WESTON ON AND IN THE VICINITY OF THE CYPRESS HILLS, N.W.T.

BY W. HAGUE HARRINGTON.

1. Calosoma calidum, *Fab.*
2. " obsoletum, *Say.*
3. " Zimmermanni, *Lec.*
4. Pasimachus punctulatus, *Hald.*
5. Amara obesa, *Say.*
6. " sp.
7. Anisodactylus semipunctatus, *Lec.*
8. Dytiscus dauricus, *Gebl.*
9. Necrophorus tomentosus, *Web.*
10. Silpha Americana, *Linn.*
11. Coccinella monticola, *Muls.*
12. Saprinus lugens, *Er.*
13. Buprestis fasciata, *Fab.*
14. " rusticorum, *Kirby.*
15. Pœcilonota ferrea, *Melsh.*
16. Aphodius occidentalis, *Horn.*
17. " sp.
18. Diplotaxis punctipennis, *Lec.*
19. Tragosoma Harrisii, *Lec.*
20. Criocephalus productus, *Lec.*
21. Monohammus maculosus, *Hald.*
22. " scutellatus, *Say.*
23. Chrysomela elegans, *Oliv.*
24. " multipunctata, *Say.*
25. Upis ceramboides, *Linn.*
26. Asida sordida, *Lec.*
27. Eleodes tricostata, *Say.*
28. " extricata, *Say.*
29. " gentilis, *Lec.*
30. " hispilabris, *Say.*
31. Nemognatha lurida, *Lec.*
32. Epicauta maculata, *Say.*
33. " sericans, *Lec.*
34. Cantharis Nuttalli, *Say.*

ENTOMOLOGY.

EDITED BY W. HAGUE HARRINGTON.

The family Carabidæ contains a large number of species of beetles of predaceous habits, and consequently of importance to mankind in destroying the larvæ of obnoxious insects. The beetles are easily found, as they mostly hide during the day under stones or similar shelters, and many of the species are so abundant as to be seen hurrying off whenever any stone or piece of wood is turned over in a field or similar locality. The largest and most conspicuous of the Ottawa species of Carabidæ belong to the genus Calosoma, although they are nearly approached in size by *Harpalus coliginosus*, a large dull-black beetle, which inhabits sandy fields, but is not common.

Calosoma calidum is abundant in fields and gardens, where it does good work in destroying cutworms, and it is readily recognized by the three conspicuous rows of fiery spots, or foveæ, which ornament each elytron. Occasionally a specimen occurs in which the spots are bright green instead of coppery or golden-red, and in the west such coloration is more common. Of a large number received from Rev. G. W. Taylor, of Victoria, about seventy-five per cent. have the green foveæ. This beetle has a wide distribution in Canada, extending from Nova Scotia to Vancouver Island.

The probable occurrence here of the large handsome green *Calosoma scrutator* has been noted in the present volume, and it is hoped that its presence at the capital may be verified. There is, however, a third species which combines some of the features of both the previous beetles, approaching *scrutator* in its shape and slender legs, but in colour resembling *calidum*, and also in the ornamentation of the elytra, except that the rows of foveæ, or punctures, are not so pronounced, and that they are green. This beetle is not often seen and may be classed with our rarer species of ground beetles. On 23rd May, 1883, a specimen was taked under a piece of driftwood on the lower end of Kettle Island, about three miles below the city, and it was several years before another was found, which was an accidental capture in the city on 28th June, 1891. Last year, on the 12th June, in a corner of the Hull beaver-meadow, on the margin of the woods, a large beetle was seen running in the grass, and on capture it proved to be the species in question: *Calosoma frigidum*.

Further search in the vicinity, among the grass and under some loosely-piled stones, resulted in the discovery of three more specimens, and subsequently, during an examination of the adjacent trees, which were almost defoliated by the caterpillars of the canker-worm moths, *Anisopteryx pometaria*, another specimen was found in a tree evidently on a hunt for these larvæ. This local abundance of the beetles was doubtless due to the plentiful supply of food at hand. The caterpillars were continually falling in such numbers that the beetles would not have much occasion to ascend the trees to hunt for them. These devastating caterpillars had been almost equally numerous the previous year, especially upon the ashes which grow in the low moist ground under consideration, and *Calosoma frigidum* had evidently multiplied more than usually, since it had not previously been found in that neighbourhood. Any member desiring specimens of this handsome beetle is advised to search there for them next June. Two specimens of this beetle were also found in the city during the summer.

Some of the species of Calosoma are quite arboreal in their habits, searching aloft the larvæ upon whose succuleut bodies they feed, but only on one occasion have I seen our common species *C. calidum* thus engaged.

On page 85 of this volume mention was made of a dipterous larva which feeds on the seeds of the so-called Canada thistle, and of a parasitic Chalcid referred to as a Solenotus. This interesting parasite has been recently re-studied by Mr Ashmead, who finds that it is really a Tetrastichid, and he has described it as *Cratæpus Fletcheri* (Can. Ent. Vol. XXIV., p. 309). The only other recognized species of the genus is a European one, also reared from a species of thistle. The fly which thus attacks our thistle heads is widely distributed in Canada, and its parasites will doubtless be found accompanying it. In September, 1888, at Hillsborough, N.B., at the head of the Bay of Fundy, a large proportion of the heads had one or more larvæ or puparia, and the easily recognized parasite, *C. Fletcheri*, was abundant. Last September the fly was found to be present at all points examined along the Intercolonial Railway in Nova Scotia, and was so abundant at Sydney, C.B., that fully fifty per cent. of the heads were infested.

THE GEOLOGICAL SOCIETY OF AMERICA.

The Fifth Annual and Winter Meeting of the Geological Society of America, as announced in the last issue of the NATURALIST, was held in Ottawa, Canada, beginning Wednesday, December 28th, 1892.

Through the kindness of Dr. J G. Bourinot, C.M,G., of the Royal Society of Canada, and Clerk of the House of Commons, the ample and commodious Room of the Railway Committee of the House of Commons was placed at the disposal of the Society. There were about forty Fellows present—sixteen of whom came from various portions of the United States of America. The meeting was under the Presidency of Mr. G. K. Gilbert, Chief Geologist to the United States Geological Survey, Washington, whilst Prof. H. L. Fairchild, of the University of Rochester, was Secretary.

If we are to judge by the attendance and interest manifested at the meetings, as well as by the number and quality of the papers presented, there is no doubt that this meeting was a decided success.

A local committee composed of Fellows of the Royal Society, members of the Logan Club which comprise the scientific staff of the Geological Survey, etc., had made all necessary arrangements for the comfort and lodging of the members during the meeting. Dr. Selwyn as Chairman of the Committee, and Mr Smith as Secretary, spared no pains in giving the visiting Fellows of the Society a good reception.

The thanks of all are due to His Excellency the Governor General for the exceedingly kind and generous manner in which he devoted so much time and attention to the Society, besides furnishing the Fellows from a distance with an excellent opportunity of having a glimpse of social life at the Canadian capital by giving an "At Home" at Rideau Hall last Friday afternoon. To Dr. Ells, Mr. J. B. Tyrrell, Mr. Smith and others, much credit is also due for their exertions in making all necessary arrangements.

THE MEETINGS.

Shortly after ten o'clock on Wednesday, the 28th ult., President Gilbert took the chair and called upon His Excellency the Governor General to give the address of welcome.

His Excellency delivered a very neat address which was received enthusiastically. To this the President replied and referred to the proverbial hospitality for which Canadians were noted.

The report from Council was then made and the result of the vote announced so far as conclusions were arrived at. The following leading officers were then declared elected :—

President................Sir J. William Dawson.
Secretary................Prof. H. L. Fairchild.
Treasurer................Dr. I. C. White.

The Secretary's report, as well as that of the Treasurer, showed the Society to be in a flourishing condition.

Then followed obituary notices of three deceased Fellows: T. Sterry Hunt, J. S. Newberry, and J. H. Chapin. Prof. Raphael Pumpelly's notice of Dr. Hunt was read by Mr. Van Hise ; that of Prof. Newberry, prepared by Dr. Kemp, was read by Prof. H. L. Fairchild; and Prof. Hitchcock read Mr. W. M. Davis's memorial of J. H. Chapin.

READING OF PAPERS.

The reading of papers or work proper of the Society began on Wednesday afternoon at 2 p.m. The following is a list of the papers, in the order in which they were taken up at the meetings. The whole time of the Society was taken up in reading and discussing papers until a late hour on Friday, the 30th December. Time and space do not allow us here to do justice to the interesting discussions on the papers presented. Both Glacial and Archæan Geology received a goodly share of animated discussion, whilst a few papers on palæontology also stimulated further enquiry. Dr. Willard Hayes's paper on "the new geology" was a splendid contribution to the geomorphology of the district examined by that author and described at the meeting.

LIST OF PAPERS.

A. R. C. Selwyn—On the coals and petroleums of the Crow's Nest Pass, Rocky Mountains. (15 minutes).

H. P. Brumell—On the geology of natural gas and petroleum in Ontario. (20 minutes).

H. P. BRUMELL—Note on the occurrence of petroleum in Gaspé, Quebec. (10 minutes).

ELFRIC DREW INGALL—Some features of the phosphate bearing rocks of Ottawa. (15 minutes). (Read by title).

SIR J. WILLIAM DAWSON—Note on sponges found in the Cambro-Silurian at Little Metis, Canada.

(Read in the absence of the author by Mr. F. D. Adams.)

J. F. WHITEAVES—Notes on the Devonian formation of Manitoba and the N. W. Territories. (5 minutes).

HENRY M. AMI—Notes on Cambrian fossils from the Selkirks and Rocky Mountain Region of Canada. (15 minutes.)

HENRY M. AMI—On the Potsdam and Calciferous terranes of the Ottawa Palæozoic basin. (10 minutes).

R. D. SALISBURY—Distinct glacial epochs, and the criteria for their recognition.

J. B. TYRRELL—Pleistocene phenomena in the region southeast and east of Lake Athabasca, Canada. (15 minutes).

A. P. LOW—Notes on the glacial geology of the Northeast Territories. (20 minutes.)

ROBERT CHALMERS—The height of the Bay of Fundy coast in the glacial period relative to sea level, as evidenced by marine fossils in the boulder clay at Saint John, New Brunswick. (20 minutes).

W. J. MCGEE — The Pleistocene history of northeastern Iowa. (20 minutes).

WARREN UPHAM—Eskers near Rochester, N.Y. (15 minutes).

WARREN UPHAM—Comparison of Pleistocene and present ice sheets. (30 minutes.)

G. FREDERICK WRIGHT — The post-glacial outlet of the Great Lakes through Lake Nipissing and the Mattawa River. (15 minutes.)

N. H. DARTON — On certain features in the distribution of the Columbia formation on the middle Atlantic slope.

George M. Dawson—Note on the geology of Middleton Island, Alaska. (10 minutes). (Read by R. W. Ells.)

Waldemar Lindgren—Two Neocene Rivers of California.

Robert W. Ells—On the Laurentian of the Ottawa district. (20 minutes).

Robert Bell—The contact of the Laurentian and Huronian north of Lake Huron. (20 minutes).

W. H. C. Smith—The Archæan Rocks west of Lake Superior. (15 minutes).

Alfred E. Barlow—On the Archæan of the Sudbury mining district. (15 minutes).

C. R. Van Hise—The volcanics of the Huronian south of Lake Superior.

Charles Rollin Keyes — Some Maryland granites and their origin. (10 minutes.) (Read by Mr. U. S Grant).

Charles Rollin Keyes — Epidote as a primary component in granites. (15 minutes). (Read by Mr. U. S. Grant).

James McEvoy—Notes on the gold range in British Columbia. (15 minutes).

Israel C. Russell—A geological reconnoissance in the central part of the State of Washington. (25 minutes).

R. W. Ells—The importance of photography in illustrating geological structure. (10 minutes).

J. W. Powell—The work of the U. S. Geological Survey. (20 minutes). (Read by W. J. McGee.)

J. S. Diller—Cretaceous and Tertiary rocks of the Pacific States.

T. W. Stanton—On the faunas of the Shasta and Chico formations.

C. Willard Hayes and M. R. Campbell — Geomorphology of the southern Appalachians. (25 minutes).

N. H. Darton—Overthrust faults in eastern New York (10 minutes) (Read by W. J. McGee).

The President's address on the "Problems of the Continents" was an admirable paper, which brings up and introduces a subject of paramount interest and importance. It serves as a preliminary basis for work in connection with the coming meeting of geologists at the International Congress, to be held in Chicago this summer.

Of Mr. W. J. McGee's public lecture, given in the new Auditorium of the Normal School, on the subject, "A Fossil Earthquake," seldom has an Ottawa audience listened to a clearer and more striking bit of inductive reasoning than this lecture. About 300 persons were present, and the lecture was illustrated by stereopticon views. Mr. H. N. Topley kindly assisted the lecturer in this matter.

After the reading of the last paper on the list and programme of Friday evening, three votes of thanks were unanimously passed by the Society.

The *first*, to the President and fellows of the Royal Society of Canada, for their invitation and attention during the Session of the Geological Society.

The *second*, to the Governor General, for his hospitality, and generous as well as the gracious interest he had taken in the meetings.

The *third*, to the Logan Club of Ottawa for its exertions in making the meeting a success.

One interesting feature of these meetings was the presence of the Premier of Canada, the Hon. Sir John Thompson, K.C.M.G., and of the Hon. T. M. Daly, Minister of the Interior and Geological Survey Departments, when Dr. McGee read the paper prepared by Major J. W. Powell, Director of the United States Geological Survey, on the work of that Survey. At the conclusion of the paper Sir John Thompson, Mr. Daly, M P, and Dr. Selwyn took part in the discussion. The comparative work and usefulness of the Geological Surveys of Canada and the United States was an interesting as well as practical question to statesmen of both countries.

Altogether, the meetings were most successful and teeming with interest. They were brought to a close with hopes of having another similar gathering at no distant date. H. M. AMI.

THE COUNTRY NORTH OF THE OTTAWA.

By Robt. W. Ells, LL.D., F.G.S.A.

Looking across the River Ottawa from the level terrace on which the Parliament Buildings are situated, we see rising to the north the series of hills known as the Chelsea Mountains, of which King's Mountain forms a prominent feature. Many of the readers of the *Naturalist* are familiar with these hills, since some of the pleasantest excursions of the Club have had them for their objective point. They rise out of the broad clay flat which extends for many miles along the course of the lower Ottawa, and consist, for the most part, of some variety of gneiss, with occasional bands of limestone. They constitute the oldest rock formation on the surface of our globe, and these rocks extend for many miles to the north, as well as to the east and west, presenting an exceedingly rugged landscape, densely clothed with forest. Where this has been removed by fires, the surface discloses great masses of rock, almost without a trace of vegetation or soil, on which such might grow. Valleys occur here and there among these hills, in which a certain amount of drift or decomposed rock has lodged, and here, for the space of several acres, conditions of soil and surroundings suitable for settlement exist. Large rivers traverse the district, and can be traced for hundreds of miles. Along these, and on many of their branches from either side, fertile areas extend, which have already been, to some extent, occupied by the hardy settler; but the area of these fertile lands, as compared with the great stretch of craggy hill and forest, is small. It was one of these settlers who, when told that his farm was situated upon the very backbone of the continent, replied with an air of disgust, that " it might very well be the backbone, but at any rate they had taken all the meat off it."

While, however, we have before our eyes daily the beautiful panorama of the Laurentian hills of the Ottawa District, it is surprising how very little is really known about the character and resources of the country lying immediately to our north. True it is that for many years the sound of the lumberman's axe, and the crash of the mighty pines have been heard; and the slash of the hunter in his lonely quest for furs, or the trail of the explorer in the search for mineral wealth, can be recognized in the heart of the most desolate wilderness. Yet beyond the narrow fringe of settlement, which skirts the northern bank of the Ottawa, and extends upwards along its principal tributaries for nearly one hundred miles, we have but little reliable information. It is possible, therefore, that a few notes, founded upon a somewhat extensive two years' wanderings through this territory, may possess some points of interest to the readers of our journal, more particularly in view of the fact that, by means of canoes, many charming holiday excursions can be made along the network of streams and lakes, which intersect this northern country, presenting not only beautiful bits of natural scenery, but, to the student of nature, excellent opportunities for extending our knowledge of the plants, insects, birds, etc., of our more immediate vicinity.

Among the more important of the streams which traverse the Laurentian area north of the Ottawa, are the St. Maurice, the Rouge, the North Nation, the Lièvre, the Gatineau, and the upper part of the Ottawa itself; to the west of Ottawa city, are the Black, the Coulonge, the Dumoine and the Kippewa, by means of which, and by crossing short portages, the great chain of lakes lying to the north, for thirty to one hundred miles, are rendered easily accessible. Most of these lakes abound with fish, such as pike, bass and trout, while the woods are alive with deer. The Gatineau itself can be traversed for over 200 miles to its source, whence, by a short carry, it is possible to reach the Ottawa on the west, and then descend to Lake Temiscamingue; or, if it is preferred, an equally short portage will enable one to launch his canoe on the head-waters of the St. Maurice, by descending which, after a journey of about 250 miles, through some of the grandest scenery of the Laurentides, he can reach the St. Lawrence at Three Rivers, half way between Quebec and Montreal; or a route can be taken northward which will reach the country of Lake St. John, from which a descent can be made by the Saguenay. Along the Gatineau and the Rouge well constructed roads extend for over 100 miles, and thus anyone desirous of investigating the botany and other branches of natural history in this section, can very easily and quickly place himself in an almost entirely unknown country in this respect.

While it must be admitted that much of the country occupied by Laurentian rocks is rough and unfitted for agricultural pursuits, there are a great many areas, often of considerable extent, to which this remark will by no means apply. On the Gatineau and Lièvre, after passing the first fifty miles, the country becomes more level, the elevations are more isolated, and a greater extent of fertile land, underlaid by calcareous rocks, is found, excellently adapted for the raising of grains, such as wheat and oats, and all kinds of root crops. Flourishing farms and comfortable houses are seen at many places, and the generally received opinion that the Laurentian country is unfitted for settlement speedily disappears. The fauna and flora of a portion of the district, or rather that area along the River Rouge, was studied by Mr. W. F. M. D'Urban, an assistant to Sir Wm. Logan, in 1858, and a partial list, relating to the mammals, fishes, insects and molluscs will be found in the appendix to the Geological Survey report for that year, while during the last two years a still further study of the plants of the district was made by Mr. R. McDougal, over a much wider area. Among the most abundant of the early flowering plants observed, was the Trailing Arbutus, (Epigæa repens) found near Ottawa, at Aylmer and Chelsea, but whose bunches of thick leaves were observed at many points to the North and East. This beautiful and exquisitely scented flower blooms in Nova Scotia as early as March, and in Gaspé was found in blossom in the last week in June. The graceful and fragrant Twin Flower forms perfect carpets in various places in this area, and many of the lakes in August are starred with the beautiful White Water-lily, some of which have blossoms of very large size, their cup-shaped flower sometimes measuring three inches in diameter.

In these Laurentian hills also are hidden great stores of mineral wealth. Mines of mica, graphite, apatite and asbestos are worked extensively in the immediate neighborhood of Ottawa, while the presence of the rarer minerals, such as garnets, zircons, tourmalines, scapolites and feldspars, in beautiful crystals, have made the district well known among collectors all over this continent.

If the members of our Club will bear in mind, when looking out for a pleasant trip for their next holiday season, that in the Laurentian country at our doors, there is a rich field for research in natural history, as well as all the requisites for a profitable outing in every way, we may expect before long to see the waters of our beautiful inland lakes disturbed by the paddles of our canoeists, while the cabinets of the students of plant and insect life will be enriched, and much additional material will be provided for the coming issues of the OTTAWA NATURALIST,

THE MINERAL WATERS OF CANADA.

By H. PEARETH H. BRUMELL, F.G.S.A. (By permission of the Director of the Geological Survey Department.)

Though many mineral waters of high curative powers are known to occur in Canada, comparatively few of them have been as yet brought to the notice of the general public, the best known being undoubtedly those obtained from the springs at Wilmot, N.S.; Apohaqui and Havelock, N.B.; St. Leon, Ste. Genevieve and St. Hyacinthe, Que. Caledonia and Winchester Springs, Ont., and Banff, Alta. Regarding these, full particulars will be found in the following pages.

It is not the intention of the writer to touch in any manner upon therapeutics, but to confine himself in this case to the collection of analyses, which have been gleaned from many sources, including Dr. T. S. Hunt's article on Mineral Waters, constituting Chapter XVIII, Geology of Canada, 1863; Mineralogy of Nova Scotia, 1868, by Hy. How; Mineral Springs of the United States and Canada, 1874, by G. E. Walton, M.D.; various articles in the Canadian Naturalist and American Journal of Science, and the reports of the Geological Survey of Canada. The analyses marked thus (*a*) have been taken from Chap. XVIII, Geology of Canada, 1863.

Although by no means a complete list, it is considered amply sufficient to illustrate the fact that Canada has within her boundaries an almost endless variety of natural curative waters.

MINERAL WATERS IN ONTARIO.

Alfred, Prescott Co. (*a*)—A Saline spring occurs on lot 9, range 10, of Alfred Township, which is said to contain 14·5 parts of solid matter in 1000 of water; and on lot 10, range 6, of the same township, two springs are said to occur, which yield saline, and somewhat alkaline waters, containing a small proportion of sulphates. These waters all rise from rocks of Cambro-Silurian age. No analyses are available.

Ancaster, Wentworth Co. (*a*)—About two miles east of the village of Ancaster is found a saline water, from which an attempt was, many years ago, made to obtain salt. Owing, however, to the low saturation of the brine, and the great amount of earthy chlorides, the enterprise was unsuccessful. The analysis of a specimen, collected in September 1847, gave the following result:

Chloride sodium	17·8280
" potassium	·0920
" calcium	12·8027
" magnesium	5·0737
Bromide sodium	·1178
Sulphate of lime	·7769
Carbonate of lime	traces
In 1000 parts of water	36·6911
Specific gravity	1029·1

About one mile and three quarters north-west of the above spring occurs a sulphurous water, which issues from rocks of the Niagara formation. This water was analyzed in 1854 by Dr. Geo. Wilson, of Edinburgh, with the following result:

Chloride sodium	3·5476
" potassium	·0052
" calcium	1·3528
" magnesium	·4190
Sulphate of lime	·6500
Carbonate "	·2035
" magnesia	·0160
" iron	·0274
Silica	·0097
Iodine	traces.
Phosphoric acid	
Alumina	
Organic matter	
In 1000 parts of water	6·2312

Sulphuretted hydrogen per 1000 inches of water. 56 c. in.

Bothwell, Kent Co.—In the "Thames Well," which was drilled in search of oil, a heavy flow of bitter sulphurous water was struck at a depth of 475 feet, and probably near the base of the Corniferous limestone. The water had a natural temperature of 57° F., and would, in consequence, be slightly thermal, as the region is traversed by the isothermal line of 47° F. The analysis (Report Geological Survey 1866, p. 273) showed:

Chloride sodium	14·4460	
" potassium	·3350	
" calcium	3·1830	
" magnesium	5·7950	
Sulphate of lime	3·0580	
Sulphide of sodium	·8797	460 HS
" hydrogen	·0767	
In 1000 parts of water	27·7734	
Specific gravity	1020·9	

The waters from many of the wells sunk for oil throughout the district, and further north, in the Enniskillen oil region, show very similar characters, and are in many instances highly sulphurous.

Brampton, *Peel Co.* (*a*)—A water having in solution a small proportion of the alkaline chlorides and sulphates, is reported from this place, though the amount of solid mineral contents, 0·38 parts in 1000 of water, hardly places it in the category of mineral waters.

Brant, *Brant Co.* (*a*)—On lot 53, township of Brant, is found a copious spring, known as the "Blue Spring," from the intense blue colour of the water in the reservoir, which lies on a mound of calc tufa. The water both tastes and smells sulphurous, though no gas is evolved. A partial analysis afforded :

Sulphate of lime	1·240
" magnesia	·207
Carbonate of lime	·198
In 1000 parts of water	1·645

Brechin, *Ontario Co.*—A strongly saline water is found near this village, on the shore of Lake Simcoe, of which the following analysis has been made by Mr. Thos. Heys, of Toronto.

Chloride sodium	201·096
" potassium	5·480
" calcium	42·176
" magnesium	35·344
Sulphate of potash	3·968
Bicarbonate of soda	35 000
Carbonate of iron	2·160
Silica and alumina	1·744
Free ammonia	·120
Organic ammonia	·008
Grains in imperial gallon	327·096

Sulphuretted hydrogen	105 20	c. inches.
Carbonic acid gas	5 728	"

This water is now aerated and bottled in Toronto, by the proprietor, Mr. L. Forrest, and placed upon the market under the name of " Eudo " water.

Caledonia Springs, Prescott Co. (*a*)—In the village of Caledonia Springs, in the township of Caledonia, are located the springs which give rise to the name, and which have for many years been visited by persons suffering from many maladies, though more especially rheumatism and derangements of the digestive organs. Besides the water annually used in the sanitarium, large quantities are shipped to points both in the United States and Canada. The springs, four in number, are known as the "Gas," " Saline," " White Sulphur," and " Intermittent," the waters of which were collected and analyzed in September, 1847, with the following result :

	Gas Spring.	Saline Spring.	White Sulphur Spring.	Intermittent Spring.
Chloride sodium	6·9675	6·4409	3·8430	12·2500
" potassium	·0309	·0296	·0230	·0305
" calcium	....	....	....	·2870
" magnesium	....	....	....	1·0338
Bromide of sodium	·0150	·0169	·0100	....
" magnesium	....	....	....	·0238
Iodide sodium	·0005	·0014	traces.	....
" magnesium	....	....	....	·0021
Sulphate of potash	·0053	·0048	·0183	....
Carbonate soda	·0485	·1762	·4558	....
" lime	·1480	·1175	·2100	·1264
" magnesia	·5262	·5172	·2940	·8632
" iron	traces.	traces.	traces.	traces.
Alumina	·0044	undet.	·0026	"
Silica	·0310	·0425	·0840	·0225
In 1000 parts of water	7·7773	7·3470	4·9407	14·6393
Specific gravity	1006·2	1005·8	1003·7	1010·9

Accompanying the flow of water from the "Gas Well" there wa in 1847 a discharge of about 300 cubic inches of carburetted hydrogen per minute. This has, however, been much lessened through operations at the spring, and it is doubtful if the flow of gas at the time of the visit of the writer, in July, 1888, was more than half that amount. About twenty-five yards distant from the above spring are situated the "Saline" and "White Sulphur" springs, the former evolving a small quantity of carburetted hydrogen, and the latter a small quantity of sulphuretted hydrogen, equal to less than a cubic inch per gallon. The temperature of the water in the Gas, Saline and White Sulphur Springs, was found to be, in September, 1847: 44·4°, 45° and 46° F. respectively,

Charlotteville, Norfolk Co. (*a*)—On lot 3, con. 12, township of Charlotteville, is found a somewhat remarkable spring of sulphurous water, issuing from the Corniferous limestone. The water rises through several openings in the mud, at the bottom of a natural basin of about 100 square yards in extent, and was found to have a flow of about sixteen gallons per minute. It has a strongly pungent taste, from the great amount of sulphuretted hydrogen which it contains. By experiment at the spring this was found to be equivalent to 11·6 cubic inches in 100 of water. The temperature of the water in the basin at the time of examination—some thirty-five years ago—was 45° F. The solid matter amounted to 2·495 parts in 1000 of water, specific gravity, 1002·7. The analysis gave the following result for 1000 parts of water:

Chloride magnesium	·0878
Sulphate soda	·4718
" potash	·0510
" lime	1·1267
" magnesia	·4351
Carbonate lime	·3050
" magnesia	·0179
" iron	traces
Sulphuretted hydrogen	·1776

Craigleith, Gray Co—About midway between Collingwood and Meaford on the Georgian Bay are situated the "Blue Mountain Mineral Springs" in the village of Craigleith.

The water was examined by Mr. Thos. Heys of Toronto, who obtained the following results:

Chloride sodium	15·732
" potassium	·303
" calcium	6·937
" magnesium	3·125
Sulphate potassium	·983
Carbonate calcium	1·462
Volatile organic matter	5·625
Grains in imperial pint	34·167
Carbonic acid gas	·621 cubic inches
Sulphuretted hydrogen	·526 cubic inches
Temperature	45·5° F.

Eastman's, *Russell Co.*—The waters of the two springs at Eastman's Springs, and known as the "Sulphur" and "Saline" were examined by Mr. G. C. Hoffmann, Chemist to the Geological Survey (Geol. Sur. rep. 1874-75 p. 317), with the following results:

	Sulphur Sp.	Saline Sp.
Chloride sodium	2·1584	18·9812
" potassium	·0400	·1577
" calcium		4·1692
" magnesium		1·9031
Sulphate potash	·0033	....
" lime		·0199
Bicarbonate soda	·8365	....
" lime	·0549	·1773
" magnesia	·1709	....
" iron	·0066	·0121
Ferric oxide		·0311
Alumina	traces	·0022
Silica	·0124	·0090
Organic matter	·0917	....
Copper		minute trace
Lithia	undet	undet
Baryta	minute trace	"
Strontia		"
Boracic acid	undet	....
Bromine		undet
Iodine	undet	undet
Phosphoric acid	undet	undet
	3·3747	
Less carbonic acid actually found	·0117	
In 1000 parts of water	3·3630	25·4628
Specific gravity	1001·95	1019.44

Fitzroy, Lanark Co.(*a*)— A saline water is found rising from rocks of the Chazy or Calciferous formation, on lot 10, range 2, Fitzroy township, at what is known as Gillan's spring. A specimen collected in July 1850, afforded the following results on analysis:

Chloride sodium	6·5325
" potassium	·1160
Bromide sodium	·0217
Iodide "	·0032
Phosphate soda	·0124
Carbonate "	·5885
" baryta	traces
" strontia	"
" lime	·1500
" magnesia	·7860
" iron	traces
Alumina	·0040
Silica	·1330
In 1000 parts of water	8·3473
Specific gravity	1006·24

Another water, which is feebly saline, and sulphurous to the taste, but which was not analyzed, occurs on lot 12, con. 6, of the same township.

Hallowell, Prince Edward Co. (*a*)—On lot 11, con. 2, township of Hallowell, a well twenty-seven feet in depth, and known as Hubb's well, afforded a water, of which the following analysis of a specimen collected in Oct., 1853, was obtained—Analysis I; while from a well about two miles distant, a specimen was obtained in the summer of 1854, affording the result shown in II. The waters of several wells in the vicinity were found to be very similar in character to these two.

	I	II
Chloride sodium	38·7315	17·4000
" potassium	traces	....
" calcium	15·9230	9·2050
" magnesium	12·9060	9·4843
Bromide sodium	·4685	undet
Iodine "	·0133	"
In 1000 parts of water	68 0423	36·08893
Specific gravity	1053 11	....

Hamilton, Wentworth, Co. (*a*)—In the Canadian Journal 1853. Prof. Henry Croft gives the the following analysis of a water said to be from Young's Spring at Hamilton:

Chloride sodium	·5098
Sulphate soda	1·6985
" lime	1·1246
" Magnesia	4·7799
In 1000 parts of water	8·1128
Specific gravity	1006.4

Hawkesbury, Prescott Co. (*a*)—A well reported to be on lot 9 con. 6 township of Hawkesbury afforded a water which gave the following result on partial analysis:

Chloride sodium	8·177
Sulphate soda	·083
Carbonate soda	1·200
" lime	·076
" magnesia	·063
In 1000 parts of water	9·599

As well as some undertermined bromides, iodides, boracic acid, oxide of iron and silica.

Kingston, Frontenac Co. (*a*)—In two borings made for water at Morton's distillery in Kingston, mineral waters were encountered specimens of which were examined by the Rev. Prof. Williamson of Queen's College, Kingston, with the following results.

	Lower Well.	Upper Well.
Chloride sodium	5·215	29·864
" calcium	4·010	12·894
" magnesium	1·763	6·954
Sulphate soda	2·441	....
" lime		·396
" magnesia		·492
Carbonate lime	·400	·370
" magnesia		1·287
In 1000 parts of water	13 830	52.257
Specific gravity	1010·0	1043·2

London, Middlesex Co.—Unfortunately no data are at hand giving an accurate analysis of the water of the Sulphur spring at London.

(*To be continued.*)

BOOK NOTICE,

THE BUTTERFLIES OF NORTH AMERICA, 3RD SERIES, PART XII.

The last part of Mr. W. H. Edwards's magnificient work has just appeared. For beauty of illustration and interest to Canadian Lepidopterists, it surpasses all previously issued parts. The first plate shows the type of *Chionobas Chryxus*, var. *Calais*, Scudder, from Hudson's Bay and a similiar form which is found at Banff in the Rocky Mountains. The second plate shows in full all the different stages of the rare Canadian species, *C. Jutta.* This insect has been twice taken at Ottawa. A special expedition having been arranged to visit the Mer Bleue in the end of June last. The day was very unpropitious, and only one specimen was seen. This was run down and captured after a hard chase. The species has been taken in restricted localities in Maine, at Quebec, Ottawa, Nepigon and in the Rocky Mountains. There are some interesting points in its life-history which need clearing up and we recommend the subject to our local members, as an opportunity for doing good scientific work. The third plate shows two more rare species of the same genus, *C Crambis* from Labrador and *C. Brucei*, which is said to have been taken at Banff by Mr. T. E. Bean.

Mr. Edwards's great work is indispensable to all Lepidopterists, and we have lately learnt with great pleasure that $500 has been granted from the "Bache Fund" of the American National Academy towards the publication of this important contribution to scientific knowledge.

J. F.

ENTOMOLOGY.

EDITED BY W. HAGUE HARRINGTON.

Among the less common coleoptera taken during the past year may be mentioned the following species :

Chlænius niger, Rand, of which a specimen was taken near Dow's Swamp on April 30th. This is our rarest species of Chlænius, only two specimens having been taken by me previously, one in Stewart's bush, (now nearly disappeared), on May 6th, 1883, and one near Hull on May 17th, 1890.

Chlœnius tomentosus, Say. This species is also not common, but a specimen was taken in the same locality, on the slope of the dam, between the canal and the swamp, on May 23rd. In shape it closely resembles the former species, but it is larger, and the elytra are tomentose with a fine silky pubescence.

Lacnocrepis parallelus, Say. One of these beetles was taken on the same date as the preceding and in the same locality, where two or three specimens had been collected by Rev. G. W. Taylor two years previously. The only other example I have from this district is one given to me by Mr. W, Simpson, and collected I believe at King's Mere.

Dromius piceus, Lec. was another interesting species taken the same day under the bark of a stump. This carabid, easily recognized by its truncated elytra is usually found either under bark, or under moss about the roots of trees, in such places as the damp woods in this swamp.

Brachys ovata, Web. An example of this pretty little buprestid was secured at Wakefield on August 7th upon oak. It may readily be distinguished, by it greater size and more purplish color, from our common *B. ærosa* which is taken upon basswood.

Typocerus zebratus, Fab. is a longicorn beetle which occurs in the latter part of July and in August upon the flowers of the golden-rod, and was taken last season at Wakefield and Aylmer. It is distinguished from our commoner species *T. velutinus* Oliv. by being smaller and by having the elytra black with four bright yellow bands, instead of red with the bands pale yellow, The members of the genus Typocerus are distingushed from the more numerous species of Leptura by the large poriferous spaces on the antennæ.

Bruchus cruentatus, Horn. This pretty little beetle, marked with a bright-orange-red patch on each elytron, was taken at Aylmer on July 31st in the blossom of the wild convolvulus (upon which were many pupae and beetles of of the spotted tortoise-beetle, *Chelymorpha argus* Licht.) A second specimen was observed and taken with the sweeping net, but escaped with the nimbleness that characterises this species. The only specimens previously taken or seen, occurred several years ago in the city.

Mycterus scaber, Hald. Several of this species were taken upon flowers (compositæ) at Aylmer on 31st July. The only previous capture of this melandryid was on the occasion of a Club excursion to the Chats Falls some years ago, when it was somewhat abundant upon small willows.

Calopus augustus, Lec. This addition to the local list was made by Mr. Fletcher, who picked up a dead and badly mutilated female on one of our streets. The insect was recognized in the collection of Mr. Evans of Sudbury who has taken there two or three examples.

:o:

A GLACIAL EPOCH.

By W. Hague Harrington.

At the dinner given by the Logan Club to the Geological Society of America, one of the learned speakers, in the course of a humorous speech, remarked that he and his fellow-scientists had come north to Ottawa to study the glaciers in their native land. At that date the " good old-fashioned winter " was just in its youth, but it has since been a subject of general interest, and of equally general—conversation. I have heard " the oldest inhabitants " going back for terrible instances to '59, and even to '37, at which ancient periods the glaciers had apparently hardly withdrawn from the Ottawa Valley to judge from the " cold waves " then experienced.

Through the courtesy of Prof. Carpmael I have obtained for the benefit of those interested in the recent cold spell, the following table. It will be observed that there was no unusually low reading of the thermometer, the lowest being - 26.2 on January 4th. By reference to some yearly abstracts published in earlier transactions of the Club, it will be seen that there were lower readings in those years, viz : December, 1884, - 28.3 ; February, 1885, - 26.9 ; January, 1886, - 26.5, and January, 1887, - 31.6. The severity of the five weeks covered by the following table was due to the almost unbroken cold, the record showing that the temperature fell below zero on 28 days, that it averaged below zero on 16 days, and that on 6 days it was not above zero. The average for the 35 days was only 1.91 above zero. With this may be compared the very cold February of 1885, which averaged 4.40, and the January of 1887, when it averaged 4.33. A very severe day was Dec. 24th, when, with an average temperature of - 1.2, the average velocity of the wind was 22⅓ miles per hour. The coldest day was January 11th, when the average was - 17.8, and the maximum - 10.8 ; the wind averaging 14⅕ miles per hour.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS AT OTTAWA,

for the period Dec. 18th, 1892, to Jan. 21st, 1893, inclusive.

Date.		Max. Tp.	Min. Tem.	Mean. Tem.	Wind-Ms
		°	°	°	
Dec.	18	14.9	—3.5	11.23	71
"	19	34.0	13.0	21.92	182
"	20	13.8	—7.5	3.05	157
"	21	18.2	2.5	7.47	102
"	22	3.8	—8.2	—4.25	198
"	23	—4.1	—15.0	—5.77	191
"	24	1.0	—8.2	—1.20	536
"	25	2.5	—13.5	—4.05	236
"	26	3.2	—18.3	—3.37	221
"	27	8.0	—1.2	3.12	166
"	28	10.0	—4.2	2.10	36
"	29	10.0	—5.5	3.87	3
"	30	20.1	—2.2	13.65	1
"	31	34.6	12.8	21.25	73
Jan.	1	29.8	18.2	26.35	212
"	2	35.2	15.8	23.30	363
"	3	17.5	—16.1	—10.35	289
"	4	—6.2	—26.2	—13.70	4
"	5	6.8	—19.6	2.47	92
"	6	12.7	—1.2	5.13	101
"	7	4.5	—5.5	—0.90	148
"	8	0.9	—14.6	—8.50	123
"	9	5.7	—16.3	2.00	161
"	10	9.8	—12.5	—8.87	366
"	11	—10.8	—21.6	—17.80	341
"	12	—1.2	—24.1	—6.50	28
"	13	3.0	—9.2	—3.75	61
"	14	—0.5	—14.3	—7.75	5
"	15	0.0	—22.2	—7.95	4
"	16	5.5	—10.5	0.92	49
"	17	8.6	—1.5	3.45	2
"	18	5.3	—2.0	3.45	108
"	19	11.8	3.2	9.10	110
"	20	12.0	0.5	9.15	172
"	21	8.8	—10.2	—1.15	80
Average		9.41	—7.11	1.91	142.6

EVENING LECTURES.

During the past month two most successful meetings of the Club have been held. On January 5th, Prof. John Macoun, Botanist, and Naturalist of the Geological Survey Department, delivered a most entertaining lecture on the Fauna and the Flora of the Selkirk summits. The large audience listened attentively while the lecturer discoursed upon the many and varied features of that remarkable range of mountains, the natural history of which he has examined more critically than any other living man. At the conclusion of the lecture, many questions were asked as to the altitudes which certain trees reached. The discussion was joined in by Messrs. J. Craig, H. M. Ami, A. G. Kingston and J. Fletcher. A paper on the Mineral Waters of Canada by Mr. H. Peareth Brumell of the Geological Survey Department was read by title.

January 19th, Food in Health and Disease, was ably treated by Dr. L. C. Prévost, who kept the attention of one of the largest audiences which has ever honoured the club. The subject, which is necessarily of interest to every one, was rendered more than usually attractive by the Doctor's original manner of presenting it, and the only regret of those present was that they could not enjoy in a material sense the many tempting luxuries mentioned in the bill of fare, given by the lecturer as a *menu* for the dinner which he described so graphically, and at which he invited them to join him. A cordial vote of thanks was proposed by Mr. J. Fletcher and seconded by Mr. J. G. Whyte.

THE FOLLOWING ARE THE TITLES FOR THE FEBRUARY LECTURES :

Feb. 2.—" Narrative of a Journey in 1890, from Great Slave Lake to Beechy Lake, on the Great Fish River," from the journal of Mr. James McKinley, Officer in charge at Fort Resolution, H.B. Co.—Mr. D. B. Dowling.

Feb. 16.—" The Development of Varieties and the Multiplication of Individuals in Horticulture."—Mr. John Craig.

" My Aquarium."—Mr. H. B. Small.

MINERAL WATERS OF CANADA.

(*Continued from Page 167.*)

This water has been used for many years in connection with baths erected over the well, where, at a depth of 114 feet from the surface, the water was struck. An analysis by Prof. Croft gave about two parts of solid matter in 1,000 of water; these consisted of nearly equal parts of the sulphates of lime and magnesia and traces of chloride of sodium, The water deposits pure yellow pulverulent sulphur around its outlet. (*Vide* report Geol. Surv., 1863-66.)

Manitoulin Islands—In well No. 1, sunk by the Manitoulin Oil Co., at a depth of 192 feet from the surface or 60 feet beneath the summit of the Trenton limestone, an intensely bitter saline water was encountered; the following analysis was made by Dr. T. Sterry Hunt:

Chloride sodium	4·800
" potassium	·792
" calcium	12·420
" magnesium	3·650
In 1,000 parts of water	21·662

The water was not examined for bromides or iodides which were, according to the analyst, probably present.

Niagara, Lincoln Co.—Full data are not at hand regarding a somewhat well-known gas spring at Niagara, which by reason of the great quantities of inflammable gas given off, is in a constant state of ebullition and is known as the "Burning Spring." The water rising from rocks of the Medina formation is peculiarly styptic and acid to the taste, and contains a very large proportion of sulphuric acid. The mean of two analyses gave Dr. Sterry Hunt 2·1376 parts of the acid (SO^3) to 1,000 parts of water.

Another spring, similar in character to the above, is noted about a mile and a half above Chippewa and near the Niagara river, wherein the water was found to be somewhat stronger in sulphuric acid. This latter water rises from the Onondaga formation.

Otonabee, Peterborough Co.—An examination was made by Mr. G. C. Hoffmann (report Geol. Surv., vol. IV, 1888-89, part R) of water from a boring on the west half of lot 26, concession 4, township of Otonabee, with the following result:

Chloride sodium	3·8403	Alumina	·0008
" potassium	·0770	Silica	·0153
" calcium	·4088	Organic matter	traces
" magnesium	·4797		
Sulphate lime	·0019	In 1,000 parts of water	5·0824
Carbonate lime	·2536	Specific gravity at 15.5° c	1003·91
" iron	·0050		

Of the physical character of the sample Mr. Hoffmann writes:—"On opening the bottles a slight, but decided, odour of petroleum was noticeable. The water contained a considerable amount of suspended matter. This was filtered off and examined—it consisted of argillaceous matter, very fine sand, partially decomposed fragments of wood, fragments of seed-cases and other vegetable matter, together with some carbonate of lime, small amounts of carbonate of magnesia and iron, and a very small amount of suphate of lime. The filtered water, when viewed in a column two feet in length, was found to have a faint brownish tinge. Taste, mildly saline. Baryta was not sought for. The presence of iodine and bromine requires confirmation."

Plantagenet, Prescott Co. (a).—Three springs are known to exist in this township, only two of which are, however, at all well known, viz.: The "Plantagenet" and the "Georgian" springs, and of which the following analyses are available:—

Chloride sodium	11·6660	9·4600
" potassium	·1040	·1040
" calcium	·1364	·0443
" magnesium	·2452	·4942
Bromide "	·0080	·0029
Iodide "	·0052	·0017
Sulphate lime	....	·1929
Carbonate lime	·0330	·2980
" magnesia	.8904	·3629
" iron	·0096	trace
Alumina	traces	undet
Silica	·0700	·0205
In 1,000 parts of water	13·1678	10·9814
Specific gravity	1009·39	1008·78

Another spring similar to the "Plantagenet" yielded 10·16 parts of solids in 1000 of water and held a comparatively large amount of strontia and traces of boracic acid.

Port Elgin, Bruce Co.—A partial analysis of a mineral water from a spring at this place was made by Mr. G. C. Hoffmann (report Geol.

Surv., vol. II, 1886, p 12 T), showing the water to contain the following:

Potassa	trace	Ferrous oxide	trace
Soda	fairly large quantity	Sulphuric acid	very large quantity
Lithia	trace	Phosphoric acid	trace
Strontia	small quantity	Silica	"
Lime	very large quantity	Chlorine	very large quantity
Magnesia	large quantity		

The water at 15·5° C. had a specific gravity of 10·0269, and contained 2·925 parts of dissolved saline matter in 1000 of water.

Sandwich, Essex Co.—At this place is located a sulphurous spring, near which was erected an hotel and baths; owing, however, to the loss of the hotel and bathhouses by fire, the spring has of late years fallen into disrepute. The water is highly sulphurous and flows from an artesian boring made some years ago for oil.

The analysis, according to Prof S. P. Duffield, gave the following result:

Chloride sodium	0·070	Carbonate lime	4·813
" calcium	0·007	" magnesia	1·618
" magnesium	19·220	Silica	0·014
Sulphate lime	15·479		
Carbonate soda	6·070	Grains in one pint	47·291
" potassa	traces		

GASES.

Carbonic acid, cubic inches	1·25
Sulphuretted hydrogen, cubic inches	4·72
Nitrogen, cubic inches	0.09

As may be seen on reference to the above, the waters of this well contain a considerable proportion of chloride of magnesium and sulphuretted hydrogen.

St. Catharines, Lincoln Co. (*a*)—Some years previous to 1863 an attempt was made to obtain brine, for the manufacture of salt, at St. Catharines. With this object, a well was drilled in the town to a depth of about 500 feet, the drill penetrating the Hudson River shales to a distance of 50 to 60 feet.

A brine of low saturation was obtained but owing to the contained lime and magnesia salts was never used in the making of salt.

This water was analysed by Prof. Croft of Toronto as given below I.

In 1861 a second boring was made by Mr. E. S. Adams resulting in the discovery of a water of similar character. Analysis II.

	I	II
Chloride sodium	29·8034	19·94
" potassium	·3555	undet
" calcium	14.8544	6·49
" magnesium	3·3977	1·95
Iodide sodium	·0042	undet
Sulphate lime	2·1923	1·77
In 1,000 parts of water	50·6075	30·15
Specific gravity	1036.0	....

This water (I) acquired quite a reputation locally and was partly evaporated and shipped in a concentrated state. Of this concentrated water, the following analysis, made by J. R. Chilton, M.D. 1853, is given in "The mineral springs of the United States and Canada, by Geo. E. Walton, M.D. New York 1874"

Chloride sodium	781·36	Sulphate lime	16·32
" calcium	2950·40	Carbonate magnesia and lime	2·08
" magnesium	1289·76	Silica, alumina, and lithia	2·47
Bromide "	2·01		
Iodide "	2·11	Grains in one pint	5,060·27
Proto-chloride iron	13·76		

"The large amount of proto-chloride of iron was probably formed from the surface of the iron vessel during evaporation."

"These celebrated waters are the most perfect type of iodo-bromated water known in this country. They very much resemble the celebrated waters of Krueznach, in Prussia, though containing the chloride of sodium, calcium and magnesium in much larger proportions." *Vide report referred to above.*

Silver Islet, Lake Superior.—The following analysis was made by Mr G. C. Hoffmann (report Geological Survey Vol. I, 1885, p. 17 M) of a specimen of water collected at the Silver Islet mine by Capt. Trethewey in 1882.

Chloride sodium	16·8098	Manganese	traces
" potassium	·4582	Cobalt	traces
" calcium	17·0867	Silica	·0540
" magnesium	1·2939		
Sulphate lime	·0672	In 1,000 parts of water	36·0634
Carbonate lime	·2936	Specific gravity at 15·5° C	1028·48

The water was colourless; odourless; taste, strongly saline with slight bitter after taste; reaction, neutral.

Tuscarora, Brant Co. (*a*)—On the Indian Reserve in this township and about nine miles south of Brantford and three miles south of the Grand River, is located what is known as the "Sour Spring of

Tuscarora." The waters of this spring form several pools of from three to four feet in diameter, where owing to a constant discharge of inflammable gas the water is in a state of agitation. In appearance it is slightly turbid and brownish and has a peculiar styptic, acid and sulphurous taste. Analysis showed the water to contain, in October 1847 :

Sulphate soda	·0502	Phosphoric acid	traces
" potash	·0608	Hydrated sulphuric acid (So3, Ho)	4·2895
" lime	·7752		———
" magnesia	·1539	In 1,000 parts of water	6·1615
" protoxide of iron	·3638	Specific gravity	1005·58
" alumina	·4681		

Westmeath, *Renfrew Co.* (*a*)—In the Geology of Canada 1863, on page 547, is given the description of two springs in this township as follows :—"On the thirteenth lot of the sixth range of Westmeath is a spring which deposits a considerable amount of calcareous tufa and is known as the Petrifying Spring". The water contains, besides carbonate of lime, small quantities of chlorids, and is feebly sulphurous. On the twenty-third lot of the same range, a copious spring, occurs on Tucker's Creek. It contains a large amount of carbonate of lime, and a little iron ; besides which, it holds only traces of sulphates and chlorids."

Whitby, *Ontario Co.* (*a*)—A copious spring of saline water is met with at Bowerman's Mills on lot 32, concession 3, township of Whitby where the water rises from rocks of the Trenton series, The following analysis was made of a specimen collected in October 1853 :—

Chloride sodium	18·9158	Carbonate lime	·0411
" potassium	traces	" magnesia	·0227
" calcium	17.5315	" strontia	traces
" magnesium	9·5437	" iron	traces
Bromide sodium	·2482		———
Iodide "	·0008	In 1,000 parts of water	46·3038

MINERAL WATERS IN QUEBEC.

Ascot, *Sherbrooke Co.*—The water of a spring near the Belvedere Iron mine and on lot 8, range 9, township of Ascot was examined during 1887 in the laboratory of the Survey (rep. Geol. Surv. Vol. III, 1887-88, p. 22 T) with the following result :—

Potassa	trace	Sulphuric acid	large proportion
Soda	small proportion	Carbonic acid	small proportion
Lime	rather large proportion	Silica	trace
Magnesia	" " "	Chlorine	small proportion
Ferrous oxide	trace		

"Total discovered saline matter, dried at 180° c., equalled 0·0746 parts in 1,000.

Baie du Febvre, Nicolet Co. (*a*)—The waters of four springs in the seigniory were examined, though of these the analysis of but one is preserved in its entirety. The analysis given below is that of a water from Courchênes spring about one and a half miles east of St. Antoine church Grand Range, and was collected in September 1852.

Chloride sodium	4·8334	Carbonate lime	·2180
" potassium	·0610	" magnesia	·4263
Bromide sodium	undet	Alumina	undet
Iodide sodium	undet	Silica	·2120
Carbonate soda	1·5416		———
" baryta	trace	In 1,000 parts of water	7·2923
" strontia	trace		

The three other springs afforded waters containing solids to the extent of 5·44, 15·94 and 4·96 parts in 1,000 of water, All of these waters probably rise from rocks of the Hudson River formation.

Bay St. Paul, Charlevoix Co. (*a*)— Several mineral waters are obtained in the neighbourhood of Bay St. Paul of which, however, no detailed analyses are available. A sample from one of these springs contained 20·68 parts of solid matter in 1,000 of water and had a bitter saline taste.

Belœil, Verchères Co. (*a*)—A mineral water from this seigniory which rises from the Hudson River formation affords the following:—

Chloride sodium	5·9662	Carbonate magnesia	·4756
" potassium	undet	" iron	traces
Bromide sodium	"	Alumina	undet
Iodide sodium	"	Silica	·1140
Carbonate soda	·6082		———
" strontia	·0250	In 1,000 parts of water	7·3330
" lime	·1440		

Berthier, Berthier Co. (*a*)—About three miles above the church at Berthier and on the Bayonne River is found a copious spring of saline water, of which a specimen collected in July 1853, afforded the following analysis :—

Chloride sodium	8·0454	Iodide magnesium	traces
" potassium	undet	Carbonate lime	·0470
" calcium	·0466	" magnesia	·8354
" magnesium	·0856		———
Bromide magnesium	undet	In 1,000 parts of water	9·0600

Caxton, St. Maurice Co. (*a*)—A saline spring rising from Cambro-silurian limestones, occurs in the township of Caxton on the banks of the Yamachiche river. The water is accompanied by very considerable quantities of carburretted hydrogen gas and had at the time of the collection of the specimen examined, October 1848, an estimated flow of eight gallons per minute. It afforded the following analysis:—

Chloride sodium	11·7750	Carbonate magnesia	1·0593
“ potassium	·0800	“ iron	·0054
“ calcium	·0503	Alumina	·0050
“ magnesium	·3743	Silica	·0479
Bromide “	·0342		
Iodide “	·0039	In 1,000 parts of water	13·6513
Carbonate lime	·2160	Specific gravity	1010·36

Chambly, Chambly Co. (*a*)—Several springs occur in the immediate neighborhood of Chambly, the waters of which are in all cases feebly saline. One of these, about three miles above the village in the Range des Quarantes, affords a very considerable quantity of saline water, containing 5·74 parts of solid matter in 1,000 of water and abundance of carburetted hydrogen gas. Temperature of water 53° F.

Another spring occuring on the Grand Coteau gave the following analysis of a specimen collected there in October 1852.

Chloride sodium	·8387	Carbonate iron	·0024
“ potassium	·0324	Alumina	·0063
Carbonate soda	1·0604	Silica	·0730
“ strontia	·0045		
“ lime	·0380	In 1,000 parts of water	2·1322
“ magnesia	·0765	Temperature of water	53° F.

Henryville, Iberville Co. (*a*)—A water containing a large amount of carbonate of soda, with chlorides, and a trace of iodides occurs about two miles south of this place. The water at the time of examination, prior to 1863, contained 16 cubic inches of sulphuretted hydrogen in 1,000 cubic inches of water. No analysis is available.

Jacques Cartier River, Portneuf Co. (*a*)—A water strongly impregnated with sulphuretted hydrogen rises from the Utica formation near Marcotte's Mills on the Jacques Cartier river, near Quebec. The specimen examined was collected in the summer of 1852 and gave:—

Chloride sodium	·0347	Carbonate magnesia	·0278
“ potassium	·0076	Alumina	undet
Sulphate potash	traces	Silica	·0110
Carbonate soda	·1952		
“ lime	·0710	In 1,000 parts of water	·3473

Joly, Lotbinière Co. (*a*)—A sulphurous water is found in this township on the Magnetat Brook about five miles from Methot's mills. The water is feebly saline and contains a portion of boracic acid, besides sulphuretted hydrogen equal to 75 cubic inches per litre. A specimen collected in July 1853, afforded the following analysis :—

Chloride sodium	·3818	Carbonate magnesia	·0257
Chloride potassium	·0067	Alumina	undet
Sulphate soda	·0215	Silica	·0245
Carbonate soda	·2301		
" lime	·0620	In 1,000 parts of water	·7523

Lanoraie, Berthier Co. (*a*)—A saline spring occurs at a point about midway between the village of Lanoraie and Industry. The water evolves large quantities of carburetted hydrogen and contains somewhat large proportions of baryta and strontia as shown in the following analysis of a specimen collected in March 1851.

Chloride sodium	11·1400	Carbonate strontia	·0137
" potassium	·1460	" lime	·4520
" barium	·0303	" magnesia	·4622
" strontuim	·0185	" iron	traces
" calcium	·2420	" Alumina	undet
" magnesium	·2790	" Silica	·0552
Bromide "	·0283		
Iodide "	·0052	In 1,000 parts of water	12·8830
Carbonate baryta	·0106	Specific gravity	1009·42

L'Assomption, L'Assomption Co. (*a*)—A saline water which some years ago was used quite extensively and was somewhat widely known is found in the range of Point du Jour, near the village of L'Assomption. The spring, known as the "Aurora spring" rises from Cambro silurian rocks and an analysis of its waters showed them to contain 7·36 parts of solid matter in 1,000 of water as well as considerable quantities of carburetted hydrogen.

Longueuil, Soulanges Co.—In the report of the Geological Survey Vol. I. 1885 page 12 M is given the analysis of a water from a spring in this seigniory and which rises from rocks of the Chazy formation. The spring has an estimated flow of about 450 gallons per minute and the water was odourless and practically tasteless. The analysis gave the following result :—

Chloride sodium	·0021	Silica	·0092
Sulphate soda	·0078		
" potassa	·0028		·1482
" lime	·0233	Carbonic acid, half combined	·0483
Carbonate lime	·0673	" " free	·0128
" magnesia	·0357		
" iron	traces	In 1,000 parts of water	·2093
		Specific gravity at 15·5° C	1.000·16

Maisonneuve, Hochelaga Co. (*a*)—An examination was made by Mr. G. C. Hoffmann in the laboratory of the Survey (report Geol. Surv Vol. IV. 1888-89. part R.) of a water from a deep boring on the property of Messrs Viau et Freres at Maisonneuve, near Montreal. The boring attained a depth of 1.500 feet, in rocks of Cambro-silurian age from which the water emanated. Of the physical features of the specimen, Mr. Hoffmann writes as follows:—

"The sample of water sent for examination had, when received, a faint yet decided odour of sulphuretted hydrogen; it contained but a trifling amount of sediment; colour of the clear water, when viewed in a column two feet in length, light yellow; taste, mildly saline; reaction, faintly alkaline."

The analysis gave the following result:—

Chloride sodium	4·0358	Silica	·0135
" potassium	·0301		
Sulphate soda	2·8624		7·3587
" lime	·0867	Carbonic acid, half combined	·1658
Carbonate lime	·0855	" " free	·0503
" magnesia	·2447		
Alumina	trace	In 1,000 parts of water	7·5748
		Specific gravity at 15·5° C	1006·31

Quarante Arpents, Nicolet Co. (*a*)—Near the line of St. Gregoire and in the concession of Quarante Arpents occurs an alkaline water, impregnating a small area of marshy ground in which a pit was dug and the specimen, of which the following is an analysis, collected in the Autumn of 1853. The water is yellowish and alkaline in taste, and rises from rocks of the Hudson River formation:—

Chloride sodium	·3290	Carbonate iron	undet
" potassium	·0318	Alumina	"
Sulphate potash	traces	Silica	"
Carbonate soda	1·1353		
" lime	undet	In 1,000 parts of water	1·5591
" magnesia	"		

Rawdon, Montcalm Co. (*a*)—In the "Geology of Canada" 1863, page 541 the following description of two springs in this township is found:—

"Two springs have been examined from the township of Rawdon. One of the third class from the twenty-fifth lot of the third range, is somewhat strongly saline, containing 4·96 parts of solid matter, in 1,000, and yielding the reactions of baryta, boracic acid, bromine and iodine. The other from the twenty-seventh lot of the same range is an abundant spring, of slightly sulphurous water, belonging to the fourth class, which yields only 0·32 parts of solid matter in 1,000 and contains portions of sulphates and borates, with a trace of bromine. These springs apparently rise from the Potsdam formation."

Rivière Ouelle, Kamouraska Co. (*a*)—In the third concession of the seigniory of Rivière Ouelle, are several small basins wherein is found a saline water. No analyses are available though a partial examination showed the water to contain 13·36 parts of solid matter made up principally of chlorides of calcium and magnesium and a small proportion of earthy chlorides, in 1,000 parts of water.

Ste. Anne de la Pocatière, Kamouraska Co. (*a*)—Several saline springs are known to exist in this seigniory of which however no analyses are available. Two of these, mentioned in the "Geology of Canada, 1863" as occuring in the second concession gave 0·36 and 5·06 parts of solid matter in 1,000 of water, the latter amount (5·06) being contained in a bitter saline water holding besides chlorides an abundance of the sulphates of lime and magnesia. The water affording 0·36 parts is slightly sulphurous and is strongly saline to the taste.

St. Benoit, Two Mountains Co. (*a*)—"A spring nearly opposite to the old church of St. Benoit, rises thorough the clays, which here overlie the Potsdam formation. The specific gravity of the water is 1004·3, and it contains about 6·0 parts of solid matter to 1,000. This water * * * * contains traces of carbonates, and large amounts of calcareous and magnesia salts, both chlorides and sulphates" vide Geology of Canada, 1863.

St. Eustache, Two Mountains Co. (*a*)—A feebly saline water, yielding 1·88 parts of solid matter to 1,000 of water and rising from rocks of the Trenton formation occurs near the village of St. Eustache in the parish of that name.

Ste. Geneviève, Batiscan Co. (*a*)—Several medicinal springs are known to occur in the vicinity of St. Genevieve and near to the Batiscan river. The waters which are strongly saline, flow from rocks of Trenton age, and in the case of that, of which No I is the analysis, give off no inconsiderable quantities of carburetted hydrogen. The analyses refer to I, from a spring about three miles above the church, and II, from a spring at the ferry landing directly opposite the church. The specimens examined were collected in August 1853.

	Trudel's spring I	Ferry spring II
Chloride sodium	17·2671	11·5094
" potassium	·2409	undet
" calcium	·6038	·2264
" magnesium	2·0523	·8942
Bromide magnesia	·0587	·0273
Iodide "	·0133	·0183
Carbonate lime	0120	·0180
" magnesia	·7506	·4464
" iron	traces	traces
Alumina	undet	undet
Silica	undet	undet
In 1,000 parts of water	20·9987	13·1400

St. Hyacinthe, St. Hyacinthe Co.—A mineral water, which is now finding a ready sale throughout the province of Quebec, is obtained at St. Hyacinthe and sold under the name of "Philudor." No data are available beyond the following analysis made by Prof. C. P. Choquette, of St. Hyacinthe College:

Chloride sodium	3·6923	Carbonate manganese	·0114
" potassium	·1230	Sulphur	·0009
" magnesium	·0415	Alumina	·0041
" lithium	·0074	Silica	·0246
Sulphate calcium	·0319	Titanic acid	traces
" barium	·0032	Free carbonic acid	·0461
" strontium	·0024	Carbonic acid (forming bicarbonates)	·0983
Carbonate sodium	·0422		
" magnesium	·0648		
" iron	·0371		

Residue at 180° C in 1,000 parts of water .... 4·4423

St. Léon, Maskinongé Co.—The best known and most widely used medicinal water found in Canada is undoubtedly that obtained at St. Leon Springs. Large quantities of this water are annually sold in all the important cities and towns of the Dominion and considerable quantities are of course used in the baths etc, at the sanitarium erected near the spring. The water is strongly saline and slightly chalybeate and at the spring evolves considerable quantities of carburetted hydrogen. The following analysis was made by Dr. T Sterry Hunt and was confirmed by Prof. O. F. Chandler of Columbia College, New York, and Jno. Baker Edwards Ph.D. etc.

Chloride sodium	677.4782	Phosphate soda	·1690
" potassium	13·6170	Bi-carbonate lime	29·4405
" barium	·6099	" magnesia	82·1280
" strontium	·5070	" iron	·6856
" calcium	3·3338	Alumina	·5830
" magnesium	59·0039	Silica	1·3694
" lithium	1·6147		
Bromide sodium	·8108	Grains in imp. gallon	871·6681
Iodide "	·2479	Specific gravity	1011·8
Sulphate lime	·0694		

Another spring (*a*) in this neighborhood occurring about a mile from the church at St. Leon and in the valley of the Rivière à la Glais, affords a very similar water to the foregoing. The water is saline, has a marked chalybeate taste and contains traces of baryta and lithia, and is accompanied by large quantities of carburetted hydrogen. The analysis of a specimen collected in October 1848 gave the following result:

Chloride sodium	11·4968	Carbonate lime	·3493
" potassium	·1832	" magnesia	·9388
" barium	·0019	" iron	·0145
" strontium	·0019	Alumina	·0865
" calcium	·0718	Silica	·0145
" magnesium	·6636		
Bromide magnesium	·0091	In 1,000 parts of water	13·8365
Iodide "	·0046	Specific gravity	1011·23

Ste. Martine, Beauharnois Co. (*a*)—"A feebly saline water from the parish of Ste. Martine, in Beauharnois, * * * probably rises from the Calciferous formation. It gives 1·98 parts of solid matter to 1,000 and contains a small portion of sulphates. The spring is said to be sulphurous"—vide Geology of Canada, 1863.

St. Ours, Richelieu Co. (*a*)—Some years prior to 1852, in which year the specimen affording the following analysis was collected, a spring was tapped while constructing a lock on the Richelieu River at St. Ours. As the water could only be obtained by means of a pump it was difficult to state positively as to the purity of the specimen obtained The analysis illustrates the character of the water afforded:

Chloride sodium	·0207	Carbonate iron	traces
" potassium	·0496	Alumina	undet
Sulphate potash	·0081	Silica	·0160
Carbonate soda	·1340		
" lime	·1740	In 1,000 parts of water	·5311
" magnesia	·1287		

St. Sèvére, St. Maurice Co.—The water of a spring occurring in this parish has lately been put upon the market under the name of "Mineral water Divina" though with what success, and under what conditions the water occurs, are not known to the writer. The only available analysis is that by Profs. Favard and Pfister of Montreal:

Chloride sodium	551·68	Phosphate soda	·96
" potassium	38·59	Bi-carbonate lime	8·61
" lithium	7·29	" magnesium	119·72
" barium	trace	" iron	18·01
" calcium	1·49	" manganese	·28
" magnesia	58·18	Alumina	37·85
Bromide sodium	398·87	Silica	5·46
Iodide "	6·42		
Sulphate lime	trace	Grains in imp. gallon	1255·25

Varennes, Verchères Co. (*a*)—Two springs known locally as the "Saline" and "Gas" springs occur at this place, the waters rising through the clay from rocks near the summit of the Utica or base of the Hudson River formation. In both instances carburetted hydrogen is given off, in the case of the saline spring in but small quantities at infrequent intervals, while from the gas spring sufficient was evolved, at one time to warrant its collection and utilization in the lighting of the house that had been erected over it. In November 1847 the temperature of the Saline spring was 47° F. and that of the Gas spring 40° F., the air being 19° F. Again on the 18th of October in the following year the temperature was taken and found to be 47·5° F. in the Saline spring, while the Gas spring was 45·5° F. the atmosphere being 44° F. The following analyses are available:

	Saline Spring	Gas Spring
Chloride sodium	9·4231	8·4286
" potassium	·1234	·0382
Bromide sodium	·0126	·0046
Iodide "	·0054	·0085
Carbonate soda	·1705	·3260
" baryta	·0226	·0123
" strontia	·0140	·0096
" lime	·3540	·3490
" magnesia	·5433	·3559
" iron	·0048	traces
Alumina	traces	"
Silica	·0465	·0540
In 1,000 parts of water	10·7202	9·5867
Specific gravity	1008·15	1007·7

MINERAL WATERS IN NEW BRUNSWICK.

Apotaqui, *Kings Co.*—A mineral water known as "Apotaqui Mineral Water" is obtained from a spring about one mile east of the village of Apotaqui, and has lately been put upon the market with marked success, being used, both medicinally and in the pure state as an emulsifier of the fatty oils for which purpose it is eminently satisfactory, making, especially with cod-liver oil, a perfect and thorough emulsion. It has also been used with beneficial effect in the cure of diabetes and gravel and other bladder affections, as well as derangements of the digestive organs.

An analysis made in 1886, by Mr. W. F. Best of St. John resulted as follows:—

Chloride sodium	·7600	Iron	traces
" potassium	·0108	Silica	·0090
Sulphate "	·0050	Organic matter	traces
Carbonate calcium	·0125		
Bi-carbonate sodium	2·0160	In 1,000 parts of water	2·8183
Magnesium	traces		

Bennet's Brook, *Kings Co.*—Near the head waters of Bennet's Brook are several springs, the waters of which might possibly be more correctly classed under the head of brines, though they have acquired a local celebrity on account of their supposed medicinal properties. No examination has been made as to their contents.

Havelock, *Kings Co.*—The spring known as the "Havelock Mineral Spring" is situated in the village of that name and has a daily flow of about 700 barrels. This water is shipped throughout the lower provinces and it is claimed has a highly curative effect upon skin diseases and affections of the digestive organs.

An analysis made in 1889, by Mr. W. F. Best, of St. John gave the following result:—

Chloride sodium	35·13	Bi-carbonate magnesium	84·55
Sulphate potassium	8·27	Iron	trace
" calcium	1·46	Iodine	"
Sulphur	·09	Silica	"
Bi-Carbonate sodium	12·44		
" calcium	19·80	Grains in imp. gallon	161·76

Norton Dale, *York Co.*—In the vicinity of Norton Dale, a settlement on the Nacawicac River, is a spring affording a water which evolves a sufficient quantity of sulphuretted hydrogen, to give the water a strong sulphurous taste and odour. No examination of the water has been made, though it is said to be used to a considerable extent locally. Many similar springs are known to occur in the vicinity, of none of which, however, is anything definite known.

MINERAL WATERS IN NOVA SCOTIA.

Bras D'Or Lake, Victoria Co.—On the north shore of the Little Narrows, Bras D'Or Lake, and about twelve miles south-west of Baddeck are several brine springs, a specimen of the water of which was examined by Mr. G. C. Hoffmann (report Geol. Surv. 1873-4, p. 181). Although more correctly a brine, it has been thought advisable to note its occurrence here, the following analysis is by Mr. Hoffmann:

Chloride sodium	50·6881	Alumina	traces
" potassium	·1942	Silica	"
" magnesium	·1593		
Sulphate calcium	5·6810	In 1,000 parts of water	56·7226

Unsuccessful efforts were made to utilize this brine in the manufacture of salt; works etc. having been erected and abandoned many years prior to 1873. Mr. Chas. Robb, who collected the specimen examined, states that in the neighborhood of the springs, of which there are several, there is a noticeable odour of sulphuretted hydrogen.

East Bay, Cape Breton Co.—At the junction of the Ben Eoin and Gaspereaux River roads, and about four miles from the shores of East Bay, is a spring which at one time had a comparatively wide reputation and was resorted to by many in search of relief from rheumatic troubles. The spring rises from syenitic rocks and the water has an unpleasant brackish and astringent taste. An analysis afforded Prof. Hy. How, Kings College, Windsor, the following result:

Chloride sodium	343·11	Phosphoric acid	traces
" potassium	4·55	Carbonate lime	·60
" calcium	308·90	" magnesia	
" magnesium	4·47		
Sulphate lime	·94	Grains in imp. gallon	662·57
Iron	traces	Specific gravity at 54° F	1007·397

Grande Anse, Richmond Co.—In the "Mineralogy of Nova Scotia 1868," page 194, Prof. Henry How, writes thus of a water found at this place:—"At Grande Anse, at the mouth of the McKenzie River, two springs issue from the metamorphic Lower Carboniferous rocks resting on the flanks of a mountain of granite and syenite. The first is highly sulphurous and contains sulphate of magnesia, and the water has very decided aperient qualities. The little pool in which it rises is coated with a white earthy deposit; gas is evolved, particularly when the neighboring ground is trodden on. The second water is mentioned as having a strong taste of magnesia, not having any sulphurous odour, and as being much used as a gentle laxative."

Halowell Grant, Antigonish Co.—About eight or nine miles north of Antigonish and on the Halowell Grant is a spring, the water of which was analysed by Mr. G. C. Hoffmann (report Geol. Surv. Vol I. 1887, p. 15 M.) and gave the following result:—

Chloride sodium	·0793	Carbonic acid half, combined	·0457
" potassium	·0137	" free	·0075
Sulphate lime	·3388		———
Carbonate lime	·0666		·5922
" magnesia	·0296	Chlorine, in excess of that required by the potassium and sodium	·0001
" iron	·0024		
Alumina	·0005		———
Silica	·0081	In 1,000 parts of water	·5923
Phosphoric acid	traces	Specific gravity at 15·5° C	1000·53
Organic matter	traces		
	———		
	·5390		

The water was inodorous and devoid of any special taste and had a faint brownish tinge.

Queensville, Inverness Co.—The water of a spring at McMaster's Mill, Queensville, was examined, (report Geol. Surv. 1879-80, page 7 H) a qualitative analysis showing it to contain the following to the extent of 5·859 parts of dissolved solid matter in 1,000 parts of water.

Potassa	a trace	Sulphuric acid	a small quantity
Soda	a very large quantity	Phosphoric acid	a " "
Lime	a small "	Carbonate acid	a " "
Magnesia	a small quantity	Chlorine	a " "
Ferrous oxide	a " "		

Neither bromine nor iodine were detected.

Wilmot, Annapolis Co.—A curative water now attracting considerable attention is obtained near the town of Middleton at what are known as the Wilmot Spa Springs. These springs have been utilized since 1830, though the highly curative power of the water was known prior to that. Besides the quantity annually used at the sanitarium erected at the springs, large quantities are now used in the preparation of aerated table waters and ginger ale. Several analyses are available, all of which have been made by Prof. Hy. How of Windsor. Of these the following is typical and is thought sufficient:

Chloride potassium	1·60	Carbonate iron	·14
Sulphate soda	8·35	Phosphoric acid	traces
" lime	121·98	Silica	·55
" magnesia	5·35	Organic matter	traces
Carbonate lime	2·70		
" magnesia	·37	Grains in imp. gallons	141·04

Windsor, Hants Co.—The following analysis was made by Prof. Hy. How, (Mineralogy of Nova Scotia, 1868, page 195) of a water from a spring which rises from Lower Carboniferous rocks near Windsor. The water was collected in 1858 and was found to be perfectly colorless and to have but little taste; its temperature was 49° F, that of the air being 31° F, and the specific gravity at 49° F, 1001·858.

Chloride sodium	0·90	Silica	0·60
Sulphate soda	0·68	Phosphoric acid and organic matter	trace
" potassa	0·38		
" lime	106·21		
" magnesia	11·02	Grains in imp. gall	138·00
Carbonate lime	17·50	Free carbonic acid (1.35 cubic ft. at 33° F.)	0·64
" magnesia	0·31		
" iron	0·40		

Miscellaneous localities—Throughout the reports of the Geological Survey, in How's Mineralogy of Nova Scotia 1868, and many other publications, may be found mention of many springs, specific information regarding which is not given. Among these may be mentioned the so-called Thermal Spring of Chester, Lunenburg Co., which is said to afford a slightly better water, probably alkaline in character. At Cheticamp, Inverness Co., a water is found which is said to have medicinal properties as is also the case at Gairloch, Pictou Co., and Earltown, Hants Co. Another spring, mentioned by Mr. Hugh Fletcher, (report Geol. Survey. 1876-78, page 456) as occuring near Deadman's Point, Washaback, Pictou Co., affords a brine smelling strongly of sulphuretted hydrogen. In Pictou Co., near the mouth of Sutherland's River, a brine used locally for medicinal purposes issues into the bed of the river, and at St. Andrews in the same county is located the so-called "Rotten Spring," the waters of which have acquired a local reputation as a cure for rheumatic and other diseases. Other localities mentioned by Mr. Fletcher (report Geol. Surv. 1879-80, page 133 F) are: Rabbit Isd, Landrie Lake and River Tillard, the water from the two latter places being chalybeate in character, while that from Rabbit Island is highly charged with sulphur, which is deposited in the pond into which it flows.

MINERAL WATERS IN MANITOBA AND THE NORTH WEST TERRITORIES.

Banff, Alberta.—The waters of the Thermal springs at this place have of late years commanded considerable attention, though more particularly since the inaugaration of the Banff National Park and the erection by the Canadian Pacific Ry., of their large sanitarium. The curative properties of the waters are too well known to require further mention here.

In the Geol. Surv. Rep. III, part II, 1887-88, p. 21 T, is an analysis of a specimen collected by Mr. R. G. McConnell:

Chloride sodium	·0110	Silica	·0398
Sulphate soda	·0089	Organic matter	trace
" potassa	·0096		
" magnesia	·2070		·9551
" lime	·5627	Carbonic acid, half combined	·0510
Carbonate lime	·1148	" free	·0434
" iron	·0013		
Alumina	undet	In 1,000 parts of water	1·0495

"The water was examined for lithia, iodine, and bromine, but no other constituents. Distinct evidence was obtained of the presence of lithia; iodine and bromine were not detected; this does not necessarily imply that they were not present in the water, in as much as the amount of water operated on was far less than would be required for the detection of traces, or even very small quantities of these substances. Geol. Surv. Rep. Vol III., 1887-88, part II, p. 22 T.

The physical features most apparent were: colourless; devoid of any marked taste; odourless; reaction faintly alkaline; specific gravity of filtered water, at 15.5° C. = 1000·99. Mr. McConnell in referring to this spring says:—"The water has a temperature of 111° F. in summer, but it is said to rise to 119° F. in winter. The lower temperature in summer may be caused by the water being affected to some extent by the surface drainage, which is more active at that season. It has a large flow, and is forced up in large quantities through an aperature several inches in diameter" * * Ibid, page 21 T.

Brandon, *Manitoba.*—A partial analysis was made in the laboratory of the Survey—Geol. Surv. Rep. 1882-84, p. 18 MM.—of a water from a shallow well north of Brandon:

Potassa and soda	a large quantity; soda predominating
Lime	a "
Magnesia	a "
Sulphuric acid	a very large quantity
Carbonic acid	a rather large quantity
Chlorine	a " small "
Sulphuretted hydrogen	

After being filtered it was found to have a content of solids—dried at 100° C = equivalent to 268·9 grains to the imp. gall. The water at the time of the examination smelt strongly of sulphuretted hydrogen and had a most offensive odour.

Clearwater River, *N. W. T.*—In the same volume an analysis is given of a specimen collected by Dr. Robert Bell and labelled as follows:—" Salt resulting from the evaporation of about five and a half quarts of water of a spring situated on the north bank of the Clearwater River, about four miles below the Cascade Rapid, N. W. T. From $\frac{1}{8}$ to $\frac{1}{4}$ more adhered to the kettle and was lost." The residue handed in for examination weighed 595 grains.

Potassa	very small quantity	Ferric oxide	very small quantity
Soda	" large "	Sulphuric acid	" large "
Lime	" " "	Chlorine	" " "
Magnesia	" "	Carbonic acid	" " "
Alumina	" small "	Insoluble residue	" " "

Rosenfeld Station, *Manitoba.*—The water was obtained from an artesian boring made at Rosenfeld Station, C. P. R., at a depth of 235 feet, from which depth and lower points the water rises and flows in considerable quantities, Mr. G. C. Hoffmann, Geol. Surv. Rep. I, 1885. p. 13M—says:—The filtered water was perfectly colorless; taste, strongly saline with a very slight bitter after taste; it did not affect the color of turmeric paper, but exhibited a slightly alkaline reaction with reddened litmus paper. The reaction for boric acid, although faint, was quite distinct. Bromine and iodine are both present—the amount of the former exceeding, apparently, that of the latter,—but owing to a total insufficiency of material, the determination of the respective amounts of these constituents, could not be carried out. The specific gravity of the water, at 15·5° C., was found to be 1032·86."

The analysis gave the following result:—

Chloride sodium	36·4971	Sulphate lime	4·1511
" potassium	·4179	Carbonate lime	·0777
" calcium	·3982	" iron	traces
" magnesium	1·7225	Silica	·0126
Bromide magnesium	undet		———
Iodide magnesium	undet	Total dissolved solid matter by direct experiment dried at 180° C	43·4280
Borate soda	undet		

"The proportion of magnesium assumed to be present as bromide and iodide, amounts to 0·0596"

Sulphur Coulée, Manitoba.—Water which rises from Cretacean shales, was obtained by Dr. G. M. Dawson from the so-called Sulphur Spring, in Sulphur Coulée, near its junction with the Pembina River, and submitted for examination to Mr. G. C. Hoffmann, who reports as follows:—Geol. Surv. Rep. II, 1886. p. 13 I:—The filtered water had a specific gravity at 15·5° C., of 1000·42 and contained 0·862 parts dissolved saline matter, dried at 180° C., in 1000 parts, by weight, of the water." A qualitative analysis gave the following result:—

Potassa	small quantity	Sulphuric acid	large quantities
Soda	rather large quantity	Carbonic acid	" "
Lithia	very small quantity	Chlorine	" "
Lime	large quantity	Organic matter	small "
Magnesia	" "		

Western Butte, Sweet Grass Hills, Alberta.—In the same volume Mr. Hoffmann gives the following result of the examination of a specimen collected by Dr. G. M. Dawson from a spring at foot hills of Western Butte, Sweet Grass Hills, where the water rises from dark Cretaceous shales. "The water, which as it issues from the spring, is charged with sulphuretted hydrogen, still contained a large quantity of that gas. It contained some suspended and sedimentary matter, consisting of carbonate of lime, a little iron, and separated sulphur, together with argillaceous and organic matter, and some sand. The filtered water had a specific gravity, at 15·5° C., of 1001·36. Total dissolved saline matter, dried at 180° C., equalled 0·857 parts in 1000"

A qualitative analysis gave the following result:—

Potassa	trace	Ferrous oxide	trace
Soda	small quantity	Sulphuric acid	small quantity
Lithia	very distinct quantity	Carbonic acid	very large quantity
Lime	fairly large quantity	Chlorine	small quantity
Magnesia	very " "	Hydrosulphuric acid	large "
Alumina	" small "	Organic matter	small "

MINERAL WATERS IN BRITISH COLUMBIA.

Dougherty's Spring, Maiden Creek.—This spring known also as the "Carbonic Acid Spring" on account of the great quantities of that gas evolved, is on Maiden Creek, south of Clinton, and between that place and Cargeriles.

Water, collected by Mr. A. Bowman, was examined by Mr. G. C. Hoffmann, (Geol. Surv. Rep. II, 1886, p. 13 T:)—

Potassa	trace	Sulphuric acid	fairly large quantity
Soda	small quantity	Carbonic acid	large quantity
Lime	large "	Silica	small "
Strontia	trace	Chlorine	" "
Magnesia	large quntity	Organic matter	" "
Alumina	very small quantity		

The water when filtered was found to have a specific gravity, at 15·5° C., of 1000·90 and contained in 1000 parts of water 1·442 parts of dissolved solid matter, dried at 180° C.

Harrison Hot Springs.—At the southern end of Harrison Lake two springs have been noted viz:—The Potash Spring and The Sulphur Spring, both of which are thermal. Samples of the water were examined. (Geol. Surv. Rep. IV, 1888-89, part R.)

Potash Spring.—Temperature of water at spring 120° F. The filtered water was perfectly colourless, inodorous and had a slightly saline taste; it showed alkaline reaction with reddened litmus paper but did not affect turmeric paper

Chloride sodium	·4059	Carbonate iron, very small amount	undet
" potassium	·0202	Alumina	undet
" lithium	undet	Silica	·0586
Sulphate soda	·4107	Organic matter	trace
" lime	·2256		———
" megnesia	·0024	In 1,000 parts of water	1·1600
" strontia	undet	Specific gravity at 15·5° C.	1001·00
Carbonate lime	·0366		

Sulphur Spring—Temperature of water at spring, 150° F. Physical features similar to last with the exception of the specific gravity, which was at 15·5° Co., 1001·13.

Chloride sodium	·4471	Sulphate strontia	undet
" potassium	·0246	Bi-carbonate lime	·0621
" lithium	undet	Alumina	trace
Sulphate soda	·4723	Silica	·0662
" lime	·2120		———
" magnesia	·0021	In 1000 parts of water	1·2864

Hot Spring Island, Queen Charlotte Islands.—No analysis of the thermal waters from the spring on this island is available, the only information at hand is that found in the report on the Queen Charlotte Islands, by Dr. G. M. Dawson, (Geol. Survey Rep., 1878-9, p. 22 B). "On the south side of Hot Spring Island is the spring from which it has been so named. Its situation is easily recognized by a patch of green, mossy sward, which can be seen from a considerable distance. Steam also generally hovers over it. The actual source of the water is not seen, but is probably not far from the inner edge of the mossy patch. * * I had no thermometer reading sufficiently high to take the temperature of the warmest streams, in which the hand could scarcely be held with comfort. * * The water has a slight smell of sulphuretted hydrogen, and a barely perceptible saline taste. The stones over which it flows, in some places show traces of a whitish deposit, and the streams and pools are choked with a slimy confervoid growth."

Nanaimo, Vancouver Island.—In Geol. Surv. Rep., 1872-73, p. 82, is an analysis of a saline water, from the so-called "Salt Spring at Nanaimo." The water, according to Mr. Jas. Richardson, who collected the specimen, issues from the coal-bearing strata near the Douglas seam, and had, in 1872, an estimated flow of about 3,500 gallons per diem. The Hudson Bay Co., prior to that date, had erected a building near the spring with the intention of manufacturing salt from the water, but the enterprise was abandoned, probably on account of the impurities the product would contain.

Chloride sodium	39·117	Carbonate iron	traces
" potassium	·627	Alumina	·038
" calcium	10·049	Silica	·038
" magnesium	·135		———
Sulphate lime	1·803	In 1000 parts of water	52·154
Carbonate lime	·347	Specific gravity	1;039·00

Shuswap Lake.—In Geol. Surv. Rcp., 1877-78, p. 25 B, Dr. G. M. Dawson describes a spring on the Spallumsheen Arm, Shuswap Lake. The spring is known to the Indians as "Pil-pil-poopil," and flows into a shallow bay. No data regarding the character of the water are available, beyond the fact that it has a faint, ferruginous taste, and traces of sulphuretted hydrogen. The temperature of the water as it comes to the surface of the bay was, in August, 1877, 70° F.

Upper Columbia Lake, North End.—About seven and a half miles north of the north end of Upper Columbia Lake is located a thermal spring, the water of which afforded (Geol. Surv. Rep. II, 1886, p. 15 T) the following result :

Potassium	trace	Sulphuric Acid	very large quantity
Soda	rather small quantity	Carbonic acid	" " "
Lithia	trace	Silica	trace
Baryta	"	Chlorine	fairly large quantity
Strontia	very small quantiy	Organic matter	small quantity
Lime	" large "	In 1000 parts of water, dried	
Magnesium	large quantity	at 180 °C	2·177
Ferrous oxide	trace	Specific gravity at 15·5° C	1001·48

Dr. G. M. Dawson, who collected the specimen, states that the discharge is not less than 20 gallons per minute, and that the temperature at the hottest point was 112°F.

Vermillion Pass.—Dr. G. M. Dawson reports several chalybeate springs which flow out through the gravel on the river flats about 6 miles west of the summit and near the place alluded to in his report as "the bend." He states that the springs are copious and of such a character as to suggest their use medicinally.—*Vide* Geol. Surv. Rep. I, 1885, p. 120 B.

Many thermal and other springs are, of course, known locally in British Columbia, but no data are available. Of some, however, although no analyses are at hand, the following notes by Dr. G. M. Dawson in his "Report on the Mineral Wealth of British Columbia Geol. Surv. Rep. III, 1887-88, 162 R. may not prove uninteresting.

"*Admiralty Island.*—Salt spring. According to analysis quoted by Pemberton in the place above cited (Nanaimo). The spring contains 65 parts of saline matter to 1,000, but with more impurities than the last (Nanaimo)."

"*Near Lilooet River.*—about five miles from head of Harrison Lake. Hot springs known as St. Agnes's Well; no particulars."

"*Sinclair Pass*—Rocky Mountains, Hot Springs, on south side of Berland's Brook, near the point at which it issues from the mountains into the Upper Columbia valley. Three springs reported, and said to be copious. Mr. John McKay, who discovered these springs, states the temperature of one as 118° F."

"*Elk River Valley.*—Rocky Mountains, about lat. 50°7 ; warm sulphur spring reported on east side of river, by Mr. H. M. Hatfield."

" *Kootanie Lake.*—Hot springs, giving its name to the " Hot Springs Mining Camp." Situated on west side of lake, directly opposite the " Blue Bell Claim." Several springs occur near the edge of the lake and some below the water level, temperature estimated at about 100° F."

" *Upper Arrow Lake.*—Hot springs. On the east side of the lake, twelve miles from its head, and one hundred and fifty yards from the lake. Said to be about as hot as can comfortably be borne in bathing."

" *Albert Canyon Station. C. P. Ry.*—Hot spring. About a mile to the north of the station. Temperature about the same as the last.

" *Near Upper Arrow Lake.*—Hot spring reported by Indians at some distance back from the lake, 3 or 4 miles from its southern end."

" *Near Albert Canyon Station.*—" Soda spring." One mile and a half west of the station on south side of the track. This and the following springs are known as " soda springs " in consequence of the presence of large quantities of carbonic acid gas."

" *Near Carne's Creek.*—On west side of Columbia River and opposite the mouth of Carne's Creek. Groups of springs with copious escape of carbonic acid gas."

" *Near Downie Creek.*—" Soda spring." Is situated about three fourths of a mile north-west of the trail from Downie to Gold creek and about four miles from the latter."

"*Four miles above Smith's Creek.*—West side of Columbia River. Springs with considerable escape of carbonic acid gas, and deposition of iron-oxide, reported."

"*Skeena River.*—Left bank about fourteen miles above " Inverness Cannery." Hot spring, no particulars."

"*Stikine River.*—Hot spring. Situated a short distance above Buck's Bar and directly opposite the Great Glacier. No particulars."

" *Kennicot Lake.*—At head of south branch of Taku River. Hot spring. Said to feed the lake. (Alaska and its Resources. Dall, p. 628)"

" *McDonald's Oil Spring.*—Head waters of Omineca River, lat. 56° This spring is marked as above on Trutch's map of British Columbia. It is not, however, an oil spring, but is described as a smalll mound in the centre of which a hollow exists charged with carbonic acid to such an extent as to prove fatal to birds and small animals."

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